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MARCH 17, 1941
VOLUME 30, No. 6

OFFICIAL PUBLICATION
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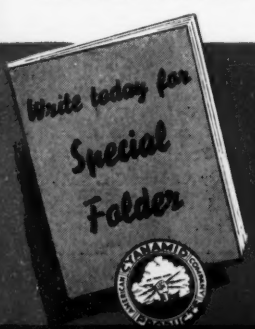

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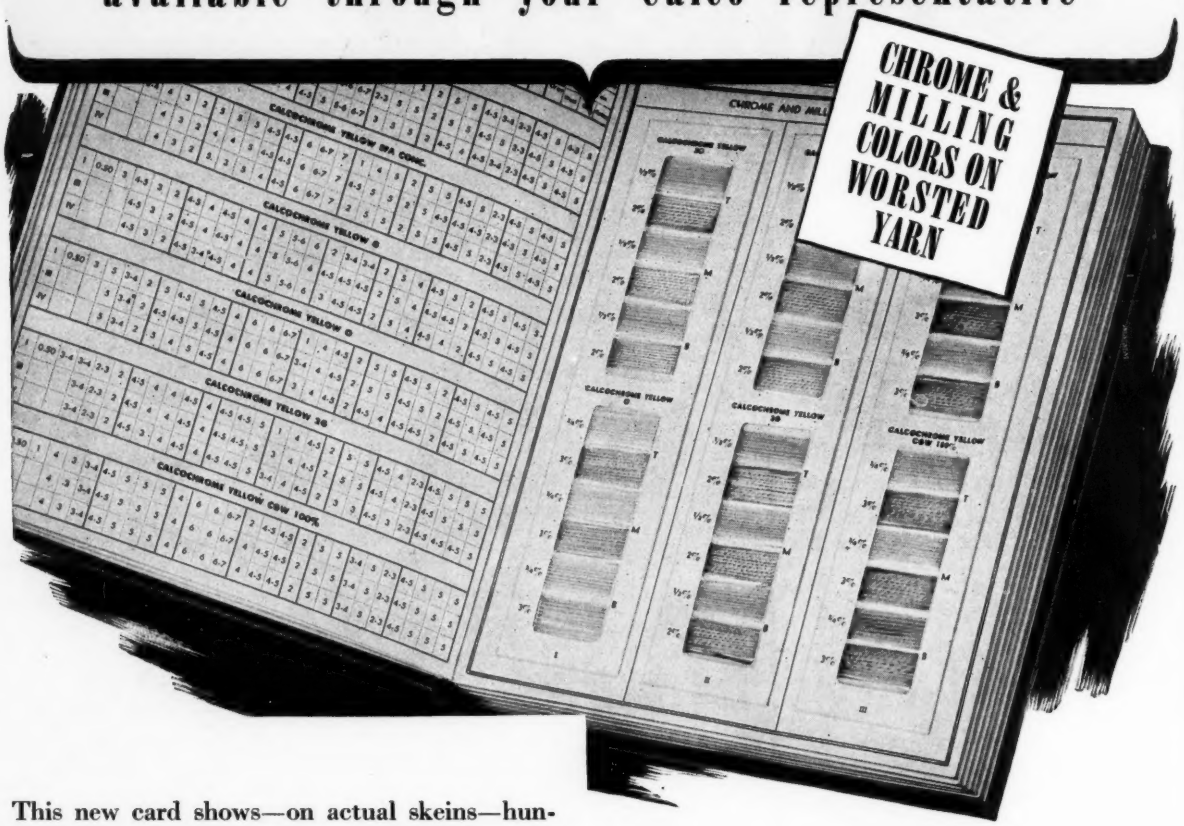

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DYESTUFF REPORTER

VOLUME 30 MARCH 17, 1941 NUMBER 6

COLOR FASTNESS ON SPUN RAYONS*

HENRY F. HERRMANN**

I UNDERSTAND that color performance on spun rayons is of special interest to the representatives of the textile industry gathered here today. Superficially the subject can be disposed of in a few words if we treat the problem simply from an academic view point, namely that rayon is rayon whether spun or continuous. Deep down, however, there are other factors—practical and commercial considerations—which must not be overlooked. Far be it from me to stand before a group of experts in the manufacture, dyeing and finishing and merchandizing of spun rayons and assume that I have any special copyright on the views that I wish to present here. To many of you, much that I will say is "old stuff" but please bear with me. We here represent varied groups which approach this cost vs. quality problem from different points of view. Although I, as a dye man am apt to be somewhat partial to the dyers' and finishers' problems, nevertheless, I shall endeavor to be fair to all sides and I hope that a better mutual understanding may result.

What is unusual about spun rayons and why are they different from other fabrics concerning which there is less need for a discussion of this sort? First of all we may mention their comparative novelty. This means new problems to the dyer but he is less baffled than the converter who must seek new outlets for these materials or the garment manufacturer who is anxious to apply them to many new uses. Much ingenuity has been revealed by him in the development of new designs for apparel intended for men, women and children. To the dyer spun rayons are simply a new form of rayon—an "artificial silk" in the dyeing of which he has become expert through years of experience. To all intents and purposes he can use the same dyes which he has applied to crepes, taffetas and plain weaves made of continuous filament rayons. He does not need any new dyes. In fact, he has no new group of dyes to choose from. This does not mean that he hasn't all the products that are needed to satisfy the needs of the commission house and manufacturer—on the contrary, he can offer on spun rayons all the shades and all the fastness properties that are obtainable on ordinary rayon and cotton constructions. Once this is understood our problem is very much simplified. Cost is the deciding factor together with a full understanding between all parties regarding what is wanted and how much will be paid for the work.

The very nature of spun rayon is such that it lends itself for many types of garments which can be both attractive in appearance and durable, both dressy and serviceable. They may have the rich appearance of linens but because of their cheapness do not command the price or permit of the same finishing costs. Linens are dyed most frequently with high grade vat or naphthol dyestuffs. These colors are extremely durable, but their cost is considerably beyond the limits often allowed for spun rayons. If you do not pay for this quality you cannot expect to get the results.

Spun rayon fabrics may resemble worsted and silk constructions. The buyers of woolens and silks pay a fancy price for them, know that they are fragile and treat them accordingly. They are either dry cleaned or washed in the home with the same care as a sheer silk stocking.

When we come to spun rayons we are confronted with a different proposition. Though inexpensive, they cost more and do not stand the abuse of cottons. They resemble finer and costlier fabrics but they attract a different market and are not given the same careful treatment. They are expected to be beautiful and yet cheap. Durability is too often overlooked or taken for granted. I said before that the same degree of color fastness is obtainable on spun rayons as on other rayons, cotton and linen, therefore the manufacturer who is contemplating the use of this material for garments that are to be guaranteed sun fast and wash fast must permit the dyer the same leeway in the finishing price to get the types of colors required as he would on other types of goods.

Let us look at the problem from a very practical point of view. One hears very often the specifications 40 and 140 meaning that the color must stand an exposure of 40

*Presented at meeting of Textile Square Club, November 12, 1940.
**General Dyestuff Corp.

hours in a standard Fade-Ometer and be washable at 140° F. with ordinary soap. I wonder how many of my listeners know what this means.

Although a fading test of 40 hours is moderate for sunfast direct colors when applied in medium and full shades, it becomes increasingly severe with lighter shades. In the case of pastel shades, it is necessary to select appropriate colors by making special tests. Where two or more dyes are required to produce a fancy shade, such tests are mandatory because the light resistance of each individual component of such mixtures is no criterion of the permanence of the composite blend. Delustered rayons present a severer problem than the lustrous variety. The pigment contained in the former stimulates fading in light shades for optical reasons which the dyer cannot overcome. Another factor which contributes to color fading is introduced by the use of so-called cationic active finishing agents, and to some degree also by urea-formaldehyde anti-crease and anti-shrink finishes. Both types of finishes are very much in demand, in fact they are frequently insisted upon. The former because it imparts softness and a very agreeable hand to the goods—the latter because crease and shrink proofing are not obtainable in other ways at the same cost.

Let us summarize the light fastness problem. Very good dyes are needed to yield 40 hour Fade-Ometer resistance in medium and full shades. Extra fast dyes are required for pastel shades under the most favorable circumstances, but when finishes are called for which aggravate fading, extraordinary care must be used in the selection of dyes for each given shade. Only the dyer fully appreciates this problem; only he, in co-operation with the service laboratories of the dye manufacturer, can solve it. No ethical dyer will guarantee the fastness of lines which have not been given this careful study nor can he guarantee work which has to be done at a price which does not permit the use of the best dyes. There are many responsible and ethical finishers who are fully conversant with the quality of the various fastness lines which they produce according to price and make no secret of their durability to light. When they guarantee fastness they mean it because they have made exhaustive laboratory tests to certify the results. These gauranteed lines seldom give trouble—but they cost more. Some converters will not pay the price for these quality lines and have their goods dyed with cheaper colors. Well and good! provided they don't sell them with implied understandings that they are fast. Too often the true facts are ignored or intentionally distorted. In consequence goods of commercial fastness acquire fast-color labels in their transit from converter to manufacturer to retailer and eventually the ultimate consumer. When the latter complains, the store cheerfully makes an adjustment and just as cheerfully passes the claim back to the supplier. Where does the claim eventually wind up? You know the answer—with the dyer! Under duress he may pay it but in principle this is all wrong. He is victimized through no fault of his. Inordinate competition may force him to submit but something must be done to correct this condition. About this I will have more to say after we have discussed fastness to washing.

Let us consider the 140° F. washing specification, which is usually called for. We must at once concede that this is a fairly severe test for dark and medium shades, less so for light shades. Although it is a strain on the colors used on spun rayons it is scarcely an adequate criterion of fastness expectancy of many types of garments which are subjected to ordinary laundering. Bear in mind that one-half hour washing in a Launderometer at 140° F. only just covers the requirements of laundry washing of colored goods and domestic washing machine practice. A beaker wash test is worthless. Ordinary direct colors are out of the question for heavy shades although specially selected ones may do for light and medium dyeings when these are given a protective urea-formaldehyde finish. However, let us not forget what influence this may have on their fastness to light. Formaldehyde aftertreated dyes are just on the border line and a few may pass the 140° F. test but not the light test in medium or light shades. What other classes of dyes are left for consideration? Of course, the diazotized and developed colors come to mind, but it may surprise you to know that one cannot take for granted their fastness to washing at 140° F. in full shades. Only selected ones stand such washing. Unfortunately, they do not hold up in the Fade-Ometer for 40 hours when dyed in light shades. There are a handful of benzo fast copper dyes which have suitable fastness properties, but are not available during present international conditions because of their foreign origin.

This leaves sulfur colors, naphthols and vat dyes open for discussion. I don't believe that sulfur colors find much favor because of application difficulties and limited light fastness features in the finer shades. Naphthol combinations are seriously restricted in versatility of shade matching and do not lend themselves particularly well for the problem of the commission dyer of dress fabrics. There are left only the better vats possessing indanthrene fastness to light and washing. The only obstacle to their use is cost. Frankly, the durability usually expected of spun rayons is obtainable only by the use of indanthrene vat dyes in light, medium and deep shades. Through very careful selection a particularly expert dyer can produce this or that shade with cheaper dyes but he cannot offer a complete line including all the prevalent shades at a low price, without running in a questionable color here and there which may later reflect on his entire output. You may be better able to answer this question out of your practical experience than I. Please remember that the dye manufacturers do not select the colors which the dyer uses. Sometimes our recommendations are solicited—very often they are put aside. Why? We cannot be fully conversant with each dyer's local problems—his restrictions as to available equipment and even if we know them we are powerless to correct them. We are not parties to the

negotiations between solicitors and converters—we do not know what promises or assurances of durability have been made. Ask us what dyestuff is necessary to yield a given shade to show specified fastness properties and we will be glad to give our recommendations to the dyer, but we cannot demand that he accept our suggestions and often for reasons best known to him he does not do so. Cost, equipment, private understanding, sometimes personal preferences, etc., etc., may be responsible for this.

A perfectly natural question is whether dyestuffs are guaranteed? The answer is not so simple and leads to other questions—such as—by whom? With what restrictions or limitations?

The dye manufacturer guarantees his colors only to be true to type in strength, shade, chemical and fastness characteristics. Since he does not apply them he cannot take any responsibility for the quality of the workmanship involved in their application. He does not control the selection of colors which are used for a given purpose, usually he does not know what the cost limitations are, what promises were made regarding quality and above all what latitude is permissible in commercial deviations from such agreements. Then how can he be accountable for the suitability of a given selection of colors and the eventual outcome? Therefore, the burden of answering for the quality of commercial dye jobs must rest with the dyer. Of course, we help him, but it must be understood that we can function only in an advisory capacity.

It happens—not occasionally but all too frequently—that a converter gives out work to be dyed with the haziest understanding regarding fastness requirements. He is satisfied by a low quotation and the dyer does not feel obligated to use anything but the products that fit into the price picture regardless of fastness. Consider the so-called silk dyers—mostly the *ex*-silk dyers. Their craftsmanship has always been in delivering ladies' dress goods dyed only to shade and attractive in finish and hand. Very little attention has been paid to fastness and seldom are fastness guarantees given or implied. Naturally, without these fastness considerations which materially influence dyeing costs they can quote lower prices. Thousands of pieces of spun rayons are processed by them and lie side by side with the work of manufacturers who literally have sweat blood—no not only blood, but have spent real money to impart to their lines the quality which they claim for them and which is considered at least a minimum requirement for their intended use. We do not question the benefits of free and open competition, nor dispute the contribution to the textile industry of the silk dyer, but we do maintain that quality differences must not be overlooked in spun rayons any more than they are in other merchandise—whether it be rayons, steel rails or automobiles! What right has any one to place a quality label on spun rayons which were processed by some Tom, Dick or Harry Dye Works for price only and without regard to fastness? This practice ruins legitimate trade and will surely bring spun rayons in ill favor with the public.

Let us stop just a moment to consider the attitude which the government is taking toward the labeling of textiles. You know the strict regulations pertaining to the honest identification of all types of artificial fibers. For years we have had mandatory restrictions to the use of the terms, "Silk" and "Linen." The recent passage of the Truth in Fabrics Law imposes very definite regulations on the labeling of wool and worsted goods. These laws affect only the identity of fibers, but Congress under the lash of an aroused nation-wide consumer movement is going further. Department of Commerce Commercial Standards CS-59-39 which delves deeply into quality and fastness features of dress fabrics will most likely acquire the status of a law and then most of the irregularities I have touched on will cease to be matters of personal consideration and will constitute serious infractions of law. If we are headed in this direction it would seem to be only logical to prepare for the inevitable.

Another consideration of the special difficulty of spun rayons which may be added to those already discussed is their prevalent use for men's sport wear. This is something quite new and in this respect colored spun rayons do not exactly replace any other fabric formerly used for the purpose. Take the golfers' colored two piece slack suits. They are supposed to stand the service of white linen or cotton trousers and white woven or knitted shirts. When the latter became soiled they were washed as hard as was necessary to clean them and seldom, if ever, was there a color problem to consider, because there was no color. Woolen trousers were sent to the dry cleaner. But, what about the spun rayon ensemble? Is it treated gently and dry cleaned like a woolen garment? Or is it expected to stand the gaff of white cotton? The latter is certainly the case. One of the severest conditions which can be imposed on cellulosic fabrics—whether they be cotton linen filament or spun rayon—is that which is encountered in sports wear. Here we encounter severe soiling, perspiration and exposure to sun. Worse, however, is the repeated wetting and drying due to intermittent physical exertion, periods of rest and with almost continuous exposure to sun. A full answer to this problem has not yet been found since some of the finest dyes occasionally fall short of expectations. This is another argument against the broad guarantee which places no restrictions on fabric use or abuse and constitutes an unjust burden on the dyer who is usually supposed to make good.

I can think of no more fitting summary to my remarks than this quotation from a letter written by the executive of one of our foremost manufacturers of spun rayons which he has graciously permitted me to use.

"For the last four years, we have consistently refused to accept any yardage on spun rayon, or spun rayon blend cloths (which include acetate blends and the wool blends)

(Continued on page 161)

NATURAL PROTEIN-BASE SPUN FIBERS*

F. C. ATWOOD**

THE technical literature of the past few years has contained numerous references to casein fibers, to soybean fibers, to fibers from zein and other proteins. Sometimes it is referred to as casein wool. Again we read of synthetic wool, of artificial wool, and other equally misleading terminology. This confusion of words is disconcerting to a chemist who approaches this field of man-made fibers for the first time. What is he to call the product when he starts with casein from milk or soybean and ends with a textile fiber, and why?

In writing this paper, I was confronted with the problem of a title. I could have continued the use of "casein wool". Everyone knows what is meant. But is the term accurate? Obviously, it is no more so than the term "artificial silk". Then why continue the use of these words and be confronted later with the job of coining a word like "rayon"?

Protein fibers do not fall under the definition of rayon. Schwarz has suggested the name "natural protein fibers" for this class. But wool and silk would fall in such a grouping. Casein is a natural protein but is used only as the base for a fiber; it is no longer casein in a satisfactory textile fiber but is combined with other materials. In a low-grade fiber the combination is very loose and may be easily hydrolyzed. But the fiber is not a simple regenerated protein in the way that rayon is regenerated cellulose. Therefore, we find the fiber we are discussing is a protein-base fiber.

What about the terms "synthetic", "artificial", or any other similar term? "Synthetic" has to do with the putting of different things together, the combination of separate substances.[1] "Artificial" means made to resemble a raw material, counterfeit, produced by art rather than by nature.[1] I do not think a protein-base fiber is included in those definitions. This fiber is actually formed or spun before there is a combination of substances. All commercially known protein-base fibers are treated or combined with formaldehyde after being spun. Moreover, it is unfair to say that the fiber is artificial. It happens to act like wool in some cases. It resembles silk and fur in other cases. Protein-base fibers are distinct entities by themselves and should be so considered.

The actual operation by which fibers are formed is neither synthetic nor artificial. "Spinning" is a true and accurate term, meaning to form by extension of a viscous liquid, to shape in manufacture into threadlike form.[1] And that is what is done in the manufacture of protein-base fibers. My subject accurately deals with natural protein-base spun fibers.

After justifying the title of this paper, it is much too unwieldy to use. A new name is still needed to classify the fiber under discussion. Assume also that we may dissolve wool and silk waste and spin it, or use protein from a number of other sources. The end products will be similar and their value determined by the quality of the finished fiber, the economies of the raw material, and the simplicity of the required process. These products would all be natural protein-base spun fibers.

The name "protex" has been suggested for this group of man-made protein textile fibers.[2] But generic names such as rayon and nylon which end in "on" are euphonious and more easily remembered. For want of a better name, I suggest "prolon" for the class of natural protein-base spun fibers.

Do the properties of these fibers justify a class name? Is their commercial success likely to warrant serious consideration by textile chemists? Are raw material sources available in quantity and at a price to furnish large volumes of fiber if the fiber is commercially useful? If the protein-base fibers are not now of high quality, is it possible for their required qualities to be improved? I believe a study of this field during the past few years will result in a favorable answer to these questions. In countries forced by circumstances to accept substitute materials, the use of such fibers is already growing. Improvement in quality is sure to come with increased production.

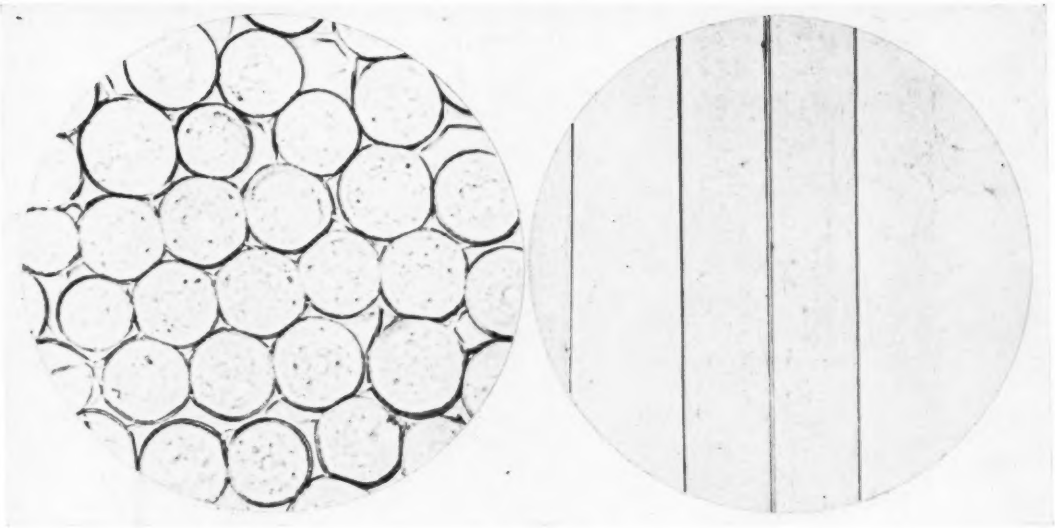
Your guess is as good as mine about what is happening in foreign countries in regard to the production of protein fibers which had been started prior to the war. I know of a few imports of staple fiber within the year from Italy, Holland, and Japan.[3] The Italian product, lanital, was of fair quality and showed some improvement over the first imports. The Dutch material appeared superior to the Italian product. The Japanese fiber was of good appearance but very poor in quality. The Japanese product is the only foreign material now available and is not suitable for domestic textile uses, although attempts will probably be made by Japanese interests to import it. These products were all made from milk casein. Some Japanese soybean casein fiber is expected soon, but the best information available indicates that the quality will be materially below that made from milk casein.[3]

Some casein fiber was made in this country by the Italian process a few years ago and tried out on the trade. It was not good enough for American users and has now all been destroyed.[3]

In 1939 factories were in commercial production of protein fibers in several foreign countries: lanital in Italy, "Casolana" in Holland, Polan in Poland, "Tiolan"

*Presented at the Detroit meeting of the American Chemical Society. Reprinted from Industrial & Engineering Chemistry.

**Atlantic Research Associates, Inc., Newtonville, Mass.



Cross-Section 500 X Mag. Longitudinal

Photomicrographs by M. A. Sieminski **CASEIN FIBER (AMERICAN MFR.)**

in Germany, Cargau in Belgium. Courtaulds casein in England, and a fiber in Japan. Another Dutch plant was ready to produce "Lactofil" by a different process from that of Ferretti, which was the method used in the other plants and tried in this country. Production was also reported in this country in an experimental plant by a process totally different from those mentioned above.[4]

German magazines have shown data concerning Tiolan in some detail and have included small samples of the fiber and fabrics made with it.[5] The Italian product has been shown at the World's Fair.[6] It is doubtful whether the other plants are now running except, as suggested, the Japanese appear to be quite active.

Recently a trade report of Snia Viscosa's annual meeting showed that company's total output capacity to be 30 million pounds per year. Their casein supply was reported as 15 million pounds per year. Considerable improvements had been made in the elasticity and dyeing properties.[7] The supplies of casein appeared far below the reported capacity, and it would seem that this condition must be very serious since Italy's entrance into the war.

Another report early this year stated that "during 1939 Argentina was exporting casein to Italy and also casein fiber."[4] It is doubtful that fiber was made in Argentina, but the exports were probably intended for fiber. It was further reported that Argentina sold Japan 9 million pounds of casein this spring, some of which, at least, was indicated for fiber production.[8]

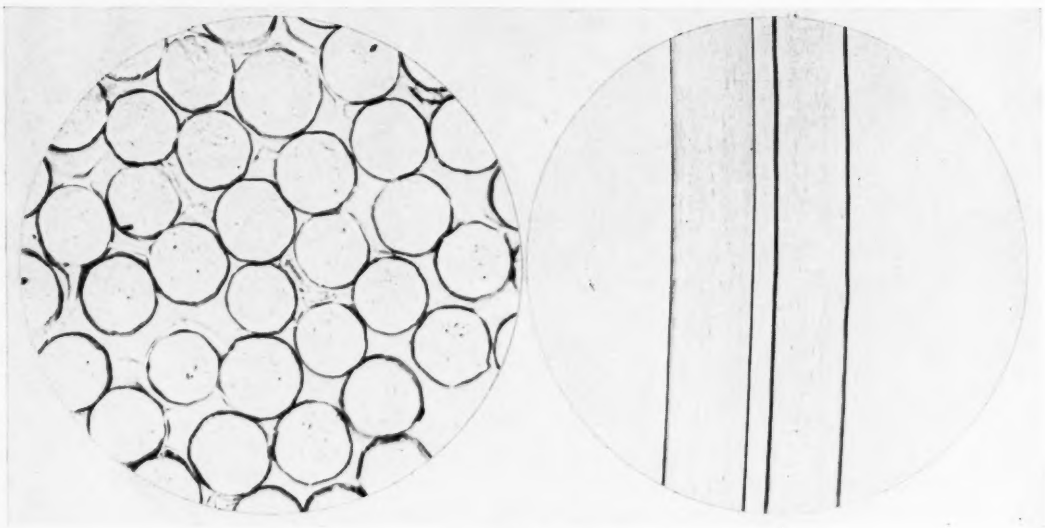
Early this year a reviewer commented on the progress of rayon in 1939 and said of casein fiber: "At this point little attention will be given to casein rayons for the reason that there is a certain amount of doubt that these will ever achieve importance and because at this stage their mechanical properties are considerably inferior to other types of rayon."[9] While the facts may have been correct, the conclusions were unwarranted and drew a rebuke from Ferretti.

As the inventor of lanital, Ferretti made out quite a case. He stated correctly that lanital is not a kind of rayon and consequently the two fibers do not admit of comparison. He pointed out that, whereas rayon is now much stronger than wool, nobody expects rayon to replace wool. By the same argument, cotton cannot replace wool even though it is much stronger. Protein-base fibers have characteristics which are difficult to measure but which make them vastly different from cellulosic fibers.

Moisture absorption is a characteristic of wool and lanital, which Ferretti points out as being an important difference as compared with cellulosic fiber. He probably means moisture regain and the quality of absorbing considerable moisture without feeling damp.

The ability of wool and casein fibers to be dyed by the same dyes is pointed out as an important point. Ferretti states that, by using certain precautions, the dye rate of wool and lanital can be made somewhat alike. Ferretti points out many other desirable qualities which his product has achieved and states that the rate of improvement of his product is far greater than the corresponding rate of improvement of rayon. He is doubtless right. He further points out some of the fields in which his product has been useful, where rayon has not and probably never can be used, particularly in felt products.

Ferretti refers to his patents on soybean casein fiber and other matters of quality. Finally, he claims that Snia Viscosa has been doubling its lanital plant at Cesano Maderno, which indicates constantly increasing use of the product.[10] Samples of lanital reaching us at intervals have not shown the results which Ferretti claims, but they do show improvement over early samples.



Cross-Section 500 X Mag. Longitudinal

Photomicrographs by M. A. Sieminski **SOYA BEAN FIBER (AMERICAN MFR.)**

All reported tests by other observers in England and Europe show requirements for care in the use of lanital and its offspring, which American users would not take the trouble to follow. For example, one operator says: "It is desirable to treat casein fiber at as low a temperature as possible. . . . The tendency is for casein fiber to shrink in hot liquors. . . . . Casein fiber has a greater dye affinity for acid dyestuffs than wool, particularly at low temperatures. . . . . Mild alkalies such as soap reduce the resistance to extension under load."[11] All such statements indicate qualities which will doubtless be corrected in any fiber made in this country before it is offered to the public.

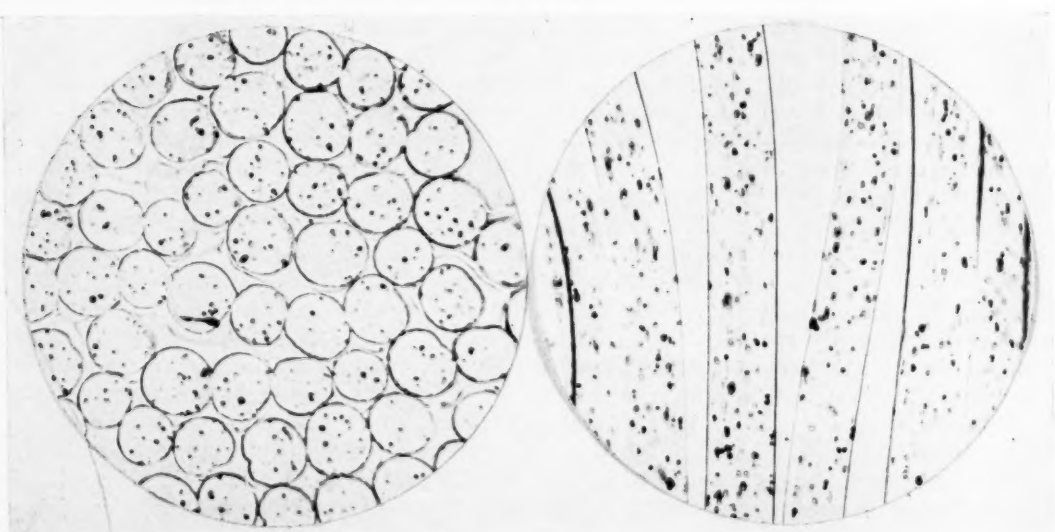
Throughout recent literature, comment is to the effect that casein fiber shows interesting felting quality with wool and that sometimes the felting quality of wool-casein fiber mixtures is greater than that with wool alone.[11] This favorable property has been repeatedly observed by us.

Certain patents indicate that the problem of spinning casein is more difficult or, at least, different from spinning cellulose filaments. Casein is regenerated or coagulated at a much slower rate than cellulose, and the machine rates and method of operation have to be materially changed to accommodate this slow coagulating rate. This point indicates the fact that casein fiber is not really workable until it has been treated with formaldehyde, and is a compound of some sort although it may be a

(Concluded on page 162)

CASEIN FIBER, PIGMENTED (ITALIAN MFR.)

Cross-Section 500 X Mag. Longitudinal



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American Association of Textile Chemists and Colorists

MARCH 17, 1941

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CALENDAR OF COMING EVENTS

Meeting, New York Section, Swiss Chalet, Rochelle Park, N. J., March 28, 1941. Speaker: Dr. W. E. Gordon, du Pont Co., "Fire Retardant Chemicals for Textiles"; Demonstration: Color Matching Lamp by W. H. Cornils, Color Analysts, Inc.

Meeting, Mid-West Section, Schroeder Hotel, Milwaukee, Wis., March 29, 1941. Events: (1) Tour through Blatz Brewery; (2) "The Problems of Color Matching," Joseph Wauters, Phoenix Hosiery Co.; (3) Color and Sound Movie, "New World Through Chemistry" by the du Pont Co.; (4) Dinner, Speaker, Mayor Carl F. Zeidler of Milwaukee; (5) "Surface Active Agents in Degumming of Silk Hosiery," Dr. O. M. Morgan, National Aniline and Chemical Co.

Spring Meeting, Piedmont Section, George Vanderbilt Hotel, Asheville, North Carolina, April 19, 1941. (Note change in date from April 12.)

Annual Meeting and Convention, Carolina Hotel, Pinehurst, N. C., Oct. 31, Nov. 1, 1941.

The Use of the Black Carpet Beetle in the TESTING OF MOTHPROOFED MATERIALS*

RUTH E. SLABAUGH

THE increased selling value of products of animal origin that are protected from the attacks of carpet beetles and clothes moths has intensified the search for a mothproofing chemical which will be permanent and yet be economical in price and application. Accelerated laboratory tests have been devised to predict in a matter of weeks the mothproofing potentialities of any particular chemical, but to date no general agreement on a standard test method has been reached and the term "mothproof" does not stand for a definite, measurable value.

The history of the testing of mothproofed materials in the United States is recent. Minaeff (1927) experimented with the black carpet beetle, *Attagenus piceus* (Oliv.), and the case-bearing clothes moth, *Tinea pellionella* Linn., pointing out differences in resistance and ability to do damage. In the same year, Jackson and Wassell described a method of testing in which the initial test was the use of a moth infested drawer with treated and untreated cloth, followed by other confirmatory tests. Peet and Grady (1928) stated that "the only satisfactory measure of mothproofing efficiency is the absence of holes in the fabric or destruction of the pile." In the following year, Minaeff and Wright (1929) criticized the drawer test of Jackson and Wassell, saying that although the method more nearly approached household conditions than their own method of confining the larvae with the sample in a test dish, they did not consider the drawer test either of positive or commercial value. These authors found the webbing clothes moth, *Tineola biselliella* Hummel, the case-bearing clothes moth, and the black carpet beetle approximately equally resistant to different chemicals, and that the carpet beetle was a better experimental insect. Test conditions and methods of judging damage were given. Jackson (1930) answered Minaeff and Wright's criticisms and described his method of testing in more detail. Moore (1930) was the first worker to consider the test insect in relation to methods of testing mothproofed materials. He described in detail specific test methods, which have been followed frequently by others. Burgess and Poole (1931) described their test methods and gave a key for judgment of damage. The need for an investigation of ways and means of testing was recognized by the Ontario Research Foundation in 1935, when they discovered that treated samples were being sent to Europe for adequate testing. Musser (1936) in comparing some mothproofing agents, used five species of insects and described test methods in some detail. Although using three test insects, Back (1937) stated his preference for the furniture carpet beetle, *Anthrenus vorax* Waterh. Stiteler (1938) has made an excellent beginning towards a standardization of test methods. He established for his use a definite size of sample, definite number and weight of larvae, definite length of test period, degree of temperature, and suggested the weight of the excrement as a criterion of damage. The examination of the larval alimentary canal was suggested by Jones (1938) as a basis for the determination of damage. Billings (1938) carried on tests with moth eggs and tested treated samples with and without dry brewer's yeast. Back and Cotton (1938) gave a good summation of the history, synonomy, food habits, life cycle and biology of the black carpet beetle. Merck & Co. (1939) devised a three step procedure of testing which involves a chemical control test, a grub cage test, where the larvae must "eat or die," and a test not described, but called the "Merck Life Cycle Test."

The trend of investigation during these years has been to work out methods of testing, find a suitable test insect, and devise a reliable measuring stick for judging the damage and thus the mothproofness of any treated sample. No general agreement has been reached, although the need of unification is being increasingly felt by certain government agencies and by commercial companies.

It was the purpose of the writer to discover those facts in the life history of the black carpet beetle which would be useful for test purposes; to determine the important factors in the test procedure, and to propose a standard measure for determining the degree of mothproofness.

THE TEST INSECT

The selection of a test insect should be guided by its food habits, general distribution, hardy constitution, adaptability for handling, lack of hiding devices, and abundant source of supply. Three species of clothes moths (Tineidae, Lepidoptera) and four species of carpet beetles (Dermestidae, Coleoptera) attack keratinous products in the United States and so could be used for test insects. The disadvantages associated with the use of the webbing clothes moth, the most common of the three species of

*Presented at Symposium on the Evaluation of Properties of Finished Textiles, Annual Meeting, New York, N. Y., October 19, 1940. This represents an abstract of a thesis submitted as partial requirement for a Ph.D. degree in Entomology at the University of Illinois.

clothes moths, outweigh the advantages. Because of its widespread distribution in homes, the writer feels that this species may well be used to obtain supplementary information, but that it should not be the only test insect.

The life cycle of the four species of carpet beetles is similar, with adult emergence in the spring and early summer months, and larval periods ranging in length from a half to several years. The larvae of the furniture carpet beetle, *Anthrenus vorax* Waterh., the common or buffalo carpet beetle, *A. scrophulariae* L., and the varied carpet beetle, *A. verbasci* L. have been used to some extent as test insects. The body of the *Anthrenus* larva is more or less oval in shape and is less sclerotized than the black carpet beetle larva and not so easily handled without fear of injury. *Laelius voracis* (Hymenoptera-Bethylidae), a parasite of the furniture carpet beetle larva, was discovered by E. A. Back and described by Muesebeck (1939).

THE BLACK CARPET BEETLE

It is believed that the increasing numbers of cases of damage in recent years, together with its suitability for testing purposes, have been largely responsible for the use of the black carpet beetle for testing mothproofed materials. It was used by the writer as a test insect because the larva is adapted to convenient handling, it is a general feeder with a wide distribution, it is hardy, and an abundant supply was available.

Attention was given to the period of pupation because of the effect that it might have upon reliable test results. Coming as it does in one season of the year, it is not uncommon to have half the number of larvae in a testing dish pupating from one observation to the next. Thus, in periods of greatest emergence the problem of obtaining accurate test results becomes much more difficult.

The emergence of the black carpet beetle adults in Urbana, Illinois, for the fall of 1939 and the spring and summer of 1940 is shown in Figure 1. Emergence is almost totally confined to the spring months with a few individuals coming out in the late summer and fall. Thus, serious trouble from pupating larvae might be expected only in the months of April and May, and some trouble in March and June. It is suggested that increasing the length of the test period, the number of tests per sample, and making more frequent examinations to eliminate the pupae and substitute feeding larvae would reduce the possibility of inaccurate results during this period. Among fifteen larvae, it was found that there was a period prior to pupation of six-eight days when the larvae did not feed.

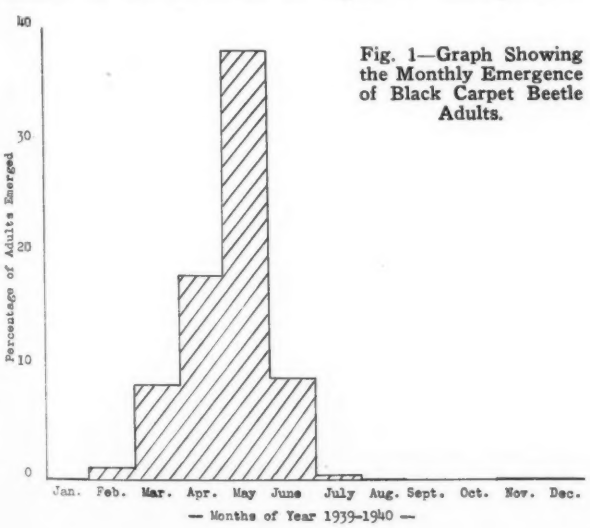

Fig. 1—Graph Showing the Monthly Emergence of Black Carpet Beetle Adults.

Molting was noticeable in the test dishes throughout the year without any relation to the season. An examination of the number of molts in all the various experiments indicates that the rate of molting is directly correlated with the rate of feeding. The number of molts on the edible samples was not much greater than on the inedible ones, but in groups of tests, the difference was consistent. This is at least true in the six week and two month test periods. Molts ranged in number from none to 18 for 15 larvae in a six week period.

The ability to withstand starvation and toxic foods was found to be directly correlated with the size of the larvae. From the results of an experiment, it was determined that in a test period of 42 days on an inedible sample, 64 per cent of the small larvae might be expected to die from starvation, 12 per cent of the medium sized larvae would die, and only 2 per cent of the large ones would succumb. One female from the large sized larval group of eight millimeters and over in length pupated after 67 days of starvation, and laid eggs from which four larvae hatched. Another female that had starved for 103 days before pupating, laid eggs from which 30 larvae hatched. Thus, it is apparent that starvation in the larval stage does not affect the ability of the adults to reproduce, and that larvae could probably lie dormant during the winter months and still change to adults in the spring.

While it has been observed that the black carpet beetle larvae prefer to feed between two surfaces rather than feeding exposed, it was thought that they would prefer to feed between two surfaces of cloth rather than one of cloth and the glass bottom of the test dish. It was concluded by experiment that larval feeding is not hindered by the smooth glass surface, upon which the larvae slip about, nor by the upside-down feeding position. There seemed to be some variation in the reaction of the larvae to the various types of material. It is believed that they dislike exposed feeding positions, and show a preference for loosely woven, long-napped fabrics over tightly woven, short-napped materials upon which they must feed from the flat surface. Moore had found that the webbing clothes moth larvae prefer the long to the short napped fabrics.

Dead larvae and pupae are frequently fed upon by the other larvae in the test dishes. No instance was seen where

living larvae and pupae were attacked. Cannabalistic feeding interferes with an accurate estimation of damage by weight of excrement and should minimized by frequent examinations to remove dead larvae and pupae.

Test Materials

The problem of testing for mothproofness is made more difficult by the diversified nature of the various mothproofed materials. Any product made up partially or wholly of animal fibers (wool, feathers, hair, bristles, fur) and attacked by keratinophagus insects may be considered by the mothproofer. On some of these products, such as clothing fabrics and felt, the damage by the test insect is visible in the form of actual holes or cut fibers. In others, such as rug cushions, rugs and battings, the damage may be at the base of the tufts or scattered through the fibers and is difficult to see and define in terms applicable to any test sample.

THE TEST METHOD

The factors which constitute the test method are the test dish, test sample, test insect, number of tests, length of testing period, physical factors such as light, heat, and relative humidity and the critical evaluation of damage. Uniformity in the use of these factors should result in the standardization of mothproofness testing.

The Test Dish

Test dishes or apparatus have been classified by the writer into two types—free and restricted. This classification is based upon the amount of freedom allowed the larvae. The free type is so named because the larvae are not restricted to one side of the sample, but may roam over both sides and around the whole test area. Examples of this type are ice cream cartons, cubical tins, petri dishes and the jelly dishes used by the writer. In the restricted type, the larvae are confined to the upper side of the sample, and cannot get to the lower side unless they eat their way through. The inverted crucible and the ring apparatus devised by the writer are examples of this type. The free type of test dish was found superior to the restricted type because of economy of operation, lessened possibility of false interpretation of damage (holes made by the larvae tunneling to the under side of the sample), and in many cases increased feeding.

Types of Tests

There are two schools of thought in the matter of types of tests for testing mothproofness. One school attempts to duplicate home conditions as closely as possible in the laboratory, including tests with adult moths, newly hatched larvae and the older larvae. The other employs, principally, a severe test where the most resistant larvae are allowed access to the treated sample and must eat or die. One tests comparative values, the other absolute values. It is believed by the writer that the test where the larvae are confined to the test sample with no other choice of food is the most important one and may be used alone for testing. It answers the question of whether the mothproofing compound is toxic; it answers the question of whether it is repellant or inedible, if the larvae are confined with the sample and do not touch it. The value of testing with newly hatched larvae is doubtful if samples have already been tested with the more mature larvae and are uninjured. The writer does not agree with those authorities who maintain that clothes moth larvae do not migrate from one garment to another, especially where clothes are hung together in close proximity. These larvae are restless in the test dishes and would escape if they were not restrained.

Size and Number of Larvae

All sizes of larvae have been used for testing purposes by the various workers. Medium sized larvae are frequently used because they are in the active feeding stage and there is less chance of their pupation during the spring months. The writer has made a practice of using fifteen black carpet beetle larvae of three sizes. Three small ones (4 mm. and under, without brush) are used more for an indication of the power of the chemical than for the actual food consumed. If they die off rapidly, it can be assumed that the treated sample had some degree of mothproofness. If they survive through the testing period, it is felt that they must be deriving some nourishment from the sample or otherwise the majority would be dead from starvation. Ten medium sized larvae (6-7 mm.) are used for the reasons stated above. The two larger larvae (8 mm. and over) are used for their greater feeding and endurance qualities. For comparative work, it would seem important that a uniformity in the size of the larvae be maintained for all samples tested. Stiteler (1938), using half grown larvae, found that he could get more consistent results by weighing the larvae so that the weight of ten was 50.0 milligrams, plus or minus one milligram.

Evaluation of Damage

Damage should be graded by the condition of the larvae, the visual damage on the test sample, and by the weight of the excrement. It is felt that all three of these methods should be used rather than one alone, and that if only one is used, it should be the weight of the excrement. The small, dry, crumby excrement pellets of the black carpet beetle larvae do not stick to the test material, or test and weighing dishes and so are easily dislodged and transferred from one dish to another. The excrement weight where mothproofness ends and the lack of it begins was set by the writer at ten milligrams for fifteen larvae for a six weeks test period. This is comparable to Stiteler's figure of six milligrams for ten larvae for four weeks.

RESISTANCE TO CHEMICALS

The success of a mothproofing chemical depends upon its ability to prevent damage from injurious insects. It may be effective in three different ways. First, it may be toxic. The degree of mothproofness will depend upon the amount of material taken in by the larvae before they

succumb. Eulan CN and the arsenicals have a toxic effect upon black carpet beetle larvae. Secondly, the compound may be repellant. The popular conception of the verb, repel, is to "drive away." The term is frequently given to chemicals which are used in the cake or vapor form to drive off the adult moths and beetles. This reaction was not noted on any of the beetle larvae. "To repel" may also mean to "check the advances." In this sense, the presence of the mothproofing compound on a fabric would check or prevent attacks by the larvae, without necessarily killing or driving them away. The fluosilicate compounds, which are frequently used to mothproof, protect in this way. In many tests with these compounds the larval death was low and the damage varied from none at all to a sufficient amount to render the fabric not mothproof. From the standpoint of injury to the sample, this control, by checking or prohibiting, is superior to the toxic treatment, where some of the sample must be eaten by the larvae to cause death.

SUMMARY

Laboratory tests for determining mothproofness have been developed in the United States within the last thirteen years. The black carpet beetle was found to be well adapted for purposes of testing mothproofness. Emergence of adults occurred chiefly in March, April, May and June. The ability to withstand starvation and toxic foods was found to be directly correlated with the size of the larvae. They prefer to feed between two surfaces rather than on the exposed upper side, and their feeding is not hindered by the glass bottom of the test dish. Dead larvae and pupae are frequently eaten. The test dish which allows the larvae access to both sides of the sample is preferable to other types because of economy of operation, lessened possibility of false interpretation of damage and in many cases increased feeding. The test where the larvae are confined to the test sample with no other choice of food is the most important one and may be used alone for testing. Three sizes of larvae are recommended for each test. Ten milligrams of excrement for fifteen larvae for a six weeks test period was set as the critical point below which a sample may be considered mothproof. Larvae react differently to various mothproofing agents.

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DISCUSSION

Dr. Dannerth: Have you made any observations on the resistance which certain dyes offer to the encroachment of the moth?

Miss Slabaugh: No, I did not, because I did not know the treatment of any of the samples with which I worked. My samples were tested as received and so I could not do any work on that phase.

Dr. Dannerth: It would be a very interesting contribution to our knowledge of the subject, because in an amateurish way I have noticed that certain fabrics dyed with certain dyes are just absolutely moth-resistant, and others are not so. Those who are interested in the study of mothproofing should certainly keep that very important factor in mind. We may have a very easy means at hand of keeping the moths away if we only get dyes of the proper constitution.

Miss Slabaugh: Yes, that is right. Some work has been done along that line with clothes moths. I can give you a reference to an article on the resistance of moth larvae to certain dyes.

Mr. Eavenson: What is the weight of test sample you generally use?

Miss Slabaugh: I did not weigh the samples. I used a one and a fourth inch square of material.

Mr. Eavenson: Have you used the technique of dusting the sample thoroughly after attack by the larvae and then weighing the difference in the weight of the sample?

Miss Slabaugh: Yes, I did, but I felt that the procedure was too cumbersome for large numbers of samples, and that the excrement weight represented more accurately the actual feeding done.

Mr. Eavenson: It sort of eliminates any previous diet that might have been there beforehand.

Miss Slabaugh: All test larvae were starved a day previous to the beginning of a test. This eliminated the excrement from the previous diet.

Mr. Froelicher: I wanted to ask Miss Slabaugh if she found any difference in the optimum conditions concerning temperature and moisture in breeding and feeding?

Miss Slabaugh: No. I did not run any experiments on optimum physical conditions. The black carpet beetle will

thrive in a long range of temperatures. It is more sensitive to moisture and is not found in damp situations.

President Draves: I think we will have to end the question period at this time. Miss Slabaugh, if you will show your slides.

Miss Slabaugh: Yes. This will take just a minute. I wanted you to see a picture of the black carpet beetle adults. This picture was taken when the beetles were dead so that you do not see the heads projected forward, as they are normally, but it does show the general body shape and coloration.

(Slide) This is a picture of three black carpet beetle larvae that are of special interest. If you will notice carefully you can see small lateral projections near the head end of each larva. These are wings. One does not usually find them on larvae because they develop internally on an insect with complete metamorphosis. But occasionally larvae are found with the wings on the outside. Such a phenomenon is called *prothetely*.

(Slide) This is a graph of the yearly emergence of the black carpet beetle adults in the fall of 1939, spring and summer of 1940. It shows the large jump in May and the relatively very small emergence in the rest of the year.

The Effect of Modern Finishing Agents on the LIGHT FASTNESS OF COTTON COLORS*

***This is a discussion which took place at a meeting of the Northern New England Section on December 20th, 1940, of the paper presented by William H. Cady for the Rhode Island Section in the Intersectional Contest at the Twentieth Annual Meeting in New York and repeated at the meeting of the Northern New England Section.**

The discussion was introduced by a paper written by Dr. Robert E. Rose of E. I. duPont deNemours & Co., Inc., and followed by another paper presented by Mr. Robert R. Ackley of the Onyx Oil & Chemical Co., Fellow, Mellon Institute of Industrial Research.

These two papers follow:

Introduction to Discussion

DR. ROBERT E. ROSE

IN New York Mr. Cady presented a paper of great interest; the crowded condition of the program left no time for the discussion which the subject merited. Tonight we are to have the pleasure of going over the ground once more with Mr. Cady, and in addition the satisfaction of a general discussion.

The program committee have assigned to me the responsibility of a preliminary statement, this I am glad to make:

In the first place the use of cationic groups to influence fastness to water is as old as the dyeing art; a cation is merely a part of a molecule that dissociates with a positive charge. The use of calcium, barium, aluminum and zinc salts to increase water fastness is in effect a use of cations. In many cases these are just as successful as those of which we are talking, in general, however, their value has never been such as to warrant the expense of their use because all of these salts are sufficiently water soluble to allow of their rapid conversion to more soluble sodium salts by the alkali of soap. In other words the treatment gave no added wash fastness and that is why they never became commercial. Mere added fastness to a cold water bleed was in itself not important enough. Exactly the same is true of these new complex organic cations; they confer no more than water fastness; to washing the dyeings are just as sensitive as before.

Why then have they been so much in evidence? First because this is a time when complex organic finishes are ever more important (and very rightly so) and second because this type of cationic radical not only increases the fastness to water but also changes the hand of the goods. These long chain bodies act as softening agents and very good ones, that exhaust onto the fiber and there is much to warrant the statement that, in fact, it is the softening effect that is the determining factor in their use. The basic patent states that the "invention opens the door for the use of direct dyestuffs for dyeing hat bands, umbrella silks, batique goods, half silk goods or half wool goods, which must be dyed by the two-bath process, the improvement constituting a considerable industrial advance."

This is not very impressive. The real field is as softening agents.

However, these materials when adsorbed have a very marked effect on the shade and fastness to light of a great many direct dyeings, in fact this effect is, as Mr. Cady will tell us, startling in its intensity. It is tacitly admitted in a circular issued in 1933 introducing a material of which it is stated "This new product is distinguished from its predecessor principally by the fact that in the aftertreatment of direct dyeings there is less alteration in shade and the fastness to light is less affected." Actually the best fast to light blues become as fugitive as the ordinary sky blues. Some of the reds lose their brilliance and become dull oranges in addition to their loss in light fastness.

There are exceptions, of course, but the result is one that must be borne in mind, whenever cationic organic fixing and softening agents are used.

Upon what does this adverse effect depend? A chemical interaction? Since the system is one of two salts it is hardly reasonable to assume anything more than a simple metathesis by which the dye-salt originally in the fiber is converted more or less completely into the dye salt of the complex cation. When solutions of dye and organic salt are mixed there is an immediate precipitation if the solutions of the latter are poured into the former; this is a fine gelatinous precipitate. On the addition of more of the reagent the precipitate appears to dissolve; actually it is becoming highly peptized and a spot test shows that there is no true solution. In the case of those dyes that change shade on cloth, the solution changes shade. The reds lose their blueness and approach orange, now this can only mean that the colloidal aggregates are smaller in the presence of the peptizing agent than those of the sodium salt; reducing particle size being generally hipsochromic in its effect.

If this assumption is true then I think we have a simple explanation for the diminished light fastness. We are dealing with the reverse of the soaping process as applied to pigment dyes of the azoic, and thioindigo series. There, with increasing aggregation, which can be followed optically, the fastness to light is improved; here with a diminution of particle size fastness is reduced. This is in full harmony with what we know of pigments used in paints and inks. But there emerges a contradictory finding; How can a process resulting in the production of smaller dye particles increase water fastness?

The answer is that the agent and the dye coalesce to form aggregates larger than those of the latter alone, but in these large aggregates the dye is dispersed almost as though it were in solution. It is then necessary to distinguish between the gross particles of the dye-cation colloidal complex and the very minute particles of dye within. That the condition of the dye, its physical state rather than a chemical change is the underlying cause of the deterioration is emphasized by the fact that other things equal the greater the change in shade the worse the light fastness and by another curious and very important observation.

Namely, if complex cations are used to produce permanent water repellency the process involves a preliminary treatment very similar to that employed in the case of the surface active cationic materials that Mr. Cady will describe. Now if a direct color dyeing is padded and dried at the relatively low temperature of the first step in the process the light fastness of the dyeing may be very badly affected; however, when the same material is passed through the fixing process, essentially a high temperature dry baking, the material becomes water repellent because the original soluble cationic radical is completely decomposed, its residual breakdown products becoming associated with the fiber. After this treatment the fastness to light is restored and the degree to which it returns is a good measure of the efficiency of the fixation of the water repellent. Treatment with cationic substances for this purpose is far less dangerous than that of using them merely to obtain increased water fastness. However, even here there seem to be a few exceptions, possibly these depend on the failure of the micellae of these dyes to aggregate when the intervening jelly is destroyed.

The fact that we can influence the particle size of dyes after they have attached themselves to the fiber by using these cationic agents will furnish us with a new tool for investigating the character of the attachment of direct dyes to cotton. It would seem almost as though a large radical of any kind tended to diminish the fastness to light by increasing the transparency of the dyestuff aggregates. I say this because already twenty years ago I encountered the problem of decreased light fastness in the case of the aryl guanidine salts of direct and acid colors. These are distinctly more fugitive than the sodium salts. Now it is possible to state that the reason for this is that the use made of these spirit soluble products is one in which the dye salt is essentially in solution, for instance, in lacquers. But this is not a sufficient explanation because a paper dipping in which there is no solvent left after the alcohol evaporates shows the color to be much less fast than the sodium salt. Indeed it is possible to convert dyes into their lithium salts, which are in most cases quite spirit soluble, and these are faster to light than the aryl guanidine salts, the only difference being the presence of the very small lithium cation as against the relatively very voluminous diorthotolylguanidine radical.

In closing I should like to make clear that I do not wish to convey the impression that the use of these cationic organic substances is ruled out by their affect on light fastness. There are many cases where the effect is not so great and the advantage of the fastness to water or water or perspiration is quite important. However, their affect is one that must be borne in mind whenever they are used commercially.

The Effect of CATIONIC FINISHING AGENTS on Direct Dyestuffs

ROBERT R. ACKLEY

At present, we are faced with a peculiar paradox. We have heard that certain finishing agents known as "cationic finishing agents" greatly reduce the light-fastness of direct and cotton dyestuffs. Yet it is safe to say that over a billion yards of rayon have been treated with agents of this type in the past few years, with virtually no customer complaints on light-fastness. The approximate percentages of the total amounts of rayon produced in the country during very recent years which have been treated with agents of this type are as follows:

	Per Cent
1937	10
1938	20
1939	35 to 40
1940	60 to 65

Certainly, from this quantity of fabric, most of which is outerwear (because underwear fabrics and lining goods are ordinarily not finished with this type of material), we should have expected to learn a great deal more concerning abnormally low light-fastness, if such a condition existed to any marked extent.

In 1937, while conducting research on cationic materials for increasing the fastness of direct dyestuffs to water, and improving the touch of textile fabrics, we encountered an article by Brown*, in which the following statement was made: "At present there are several so-called fixing agents available for direct cotton dyes. It is an unfortunate fact that most of the reagents which increase fastness to water affect fastness to light adversely." In consequence we investigated the effect of some materials of this type on light-fastness and found, as Cady† has pointed out, that the effect was largely dependent upon the ratio of the amount of cationic material used to the amount of dyestuff on the fabric. This observation appeared to be of greater importance where improving the fastness of the dyestuff was concerned than for altering the touch of the finished fabric, because the amount of dyefixing agent required is dependent upon the amount of dyestuff on the fabric, whereas for improving the feel of the fabric the amount needed is governed by the characteristics desired on the fabric regardless of the amount of dyestuff employed. In the case of dark shades, where 3 per cent or more of dyestuff was on the fabric, after-treatment with 1 per cent of a cationic finishing agent produced no detectable effect on the light-fastness of the fabric. The same amount, however, when applied to a fabric which had been dyed a very light shade, did cause a noticeable effect on the light fastness. It should be pointed out here that, on the basis of the anhydrous cationic material used, very rarely is more than ¼ to ½ per cent on the weight of the goods employed in actual practice. By anhydrous cationic material, we mean the actual effective material capable of exhausting onto the goods present in the finishing agent as it reaches the customer. This varies greatly from one product to another, for the different commercial items are diluted with various amounts of water, solvents, dextrine, fatty material, and other non-cationic fillers. The most concentrated product in general application contains 50 per cent active ingredients, while a fairly large number contain from 20 per cent to 25 per cent. While some agents will produce an undesirable effect even in this low concentration, others have practically no observable effect. It appears in this connection that the most important factor is the equivalent weight of the cationic material being tested. By the equivalent weight, we mean the amount required to precipitate a given weight of dyestuff. Thus, if one material will precipitate twice as much dyestuff as another, where used in the same amount, then, all other things being equal, the finishing agent capable of precipitating the greater amount of dyestuff will produce the greater change in light-fastness.

After Cady's paper had been presented at the annual meeting of the A.A.T.C.C. in New York, we conducted further experiments along the same lines to determine if there was actually any serious effect on light-fastness where cationic finishing materials were applied in a practical manner. For our work we used Direct Blue 4GL, which was recommended by Cady as being extremely sensitive to the presence of cationic finishing agents. A 1 per cent dyeing was made on a large scale on rayon satin, which was cut into samples of the size required for Fadeometer examination and treated separately for each test. We found that (1) the reduction of light-fastness is very largely dependent upon the temperature at which the sample is treated, (2) the greater the amount of a particular cationic finishing agent present, the greater the effect on light-fastness; and (3) if a sample is dipped

*Society of Dyers and Colourists, *53*, 90.
†American Dyestuff Reporter, *29*, 686 (1940).

and quickly removed from the solution, the amount of effect on light-fastness is almost independent of the concentration of the treating solution.

These results apparently agree very closely with Cady's conclusions. We found, however, that if from ¼ to 1 per cent of a particular cationic material is applied with a 30:1 bath to goods ratio for 30 min. at 90 to 110° F., there is very little change in the light-fastness of the dyestuff, especially if ½ per cent or less is employed. These concentrations are based on the anhydrous cationic materials, of which the average amount employed in mill operation is ¼ per cent, with ⅛ per cent frequently, and ½ per cent very infrequently used. At 120° to 160° F., employing the same concentrations, there is very little effect when ¼ per cent is used and considerably more if the amount is increased. But this temperature is from 20° to 70° greater than that ordinarily employed in the application of such finishing agents in rinsing operations in the dyehouse.

It is only natural that the degree of effect on light-fastness will vary from one product to another. On Cady's charts, for example, Nos. 15, 16, 18, and 19 should be expected to have very little, if any, effect on the light fastness, as these materials in their purest state are, with the exception of No. 16, not cationic, and are, in fact, insoluble in water. Any dispersion obtained is attributable to the presence of impurities which may be cationic in nature. In the case of No. 16, stearoylhydroxyethylethylenediaminestearate hydroacetate, we should expect it to have less effect than a monostearoyl derivative, for, on a basis of the available cationic groups, it is capable of precipitating only ¼ as much dyestuff as No. 13 on the chart (monostearoyltetraethylenepentamine tetrahydroacetate). Unfortunately, compounds such as No. 16, which have more than one fatty residue for each free amino group, have not proved to be particularly effective as finishing agents, and their poor solubility is a potential source of trouble from spotting and streaking.

When any given phenomenon is being studied, with an aim toward eliminating it, there are two types of testing procedures which may be employed. On the one hand, we may apply an exaggerated procedure, whereas, on the other hand, practical tests may be employed. Naturally, if we use 5 to 15 times as much of a given chemical as is ordinarily employed in practice, and treat the fabric at a temperature of from 20° to 70° higher than that ordinarily employed in practice, and still obtain no evidence of the phenomenon which we are trying to eliminate, then we can be reasonably sure that the material under test will not produce trouble when applied in a practical manner. In many cases, however, such conditions have been unduly severe. Actually, by proper additions to a suitable cationic finishing agent, its effect on light-fastness can be reduced to such an extent that it will pass this exaggerated test. For general purposes, however, it appears desirable to use a test which is more nearly comparable to operating conditions. If we apply, for example, the maximum amount of finishing agent used in practice and the highest temperature employed in the dyehouse, for the greatest probable length of time, the conditions are sufficiently severe for testing purposes, for ordinarily a given plant will not be operating at the least favorable limit of all these conditions. That is, if very large concentrations of a cationic finishing agent are being used, the probability is that it will still be used at a lower temperature than that followed in some plants, and perhaps for a shorter length of time. It therefore appears perfectly valid to assume that anything passing this practical test is suitable for commercial application. The most reliable information in any particular case is of course obtained by testing a sample of the fabric before and after it is treated with a cationic finishing agent. In this manner we are able to tell directly whether the conditions used in any specific plant are unduly severe. In our experiments on the effect of cationic finishing agents on the light-fastness of dyestuffs, we used the following colors:

Direct Blue 4GL ..... Colour Index No. 533
Direct Fast Scarlet 4B ..... Colour Index No. 382
Pontamine Yellow CH ..... Colour Index No. 365
Diazo Black Extra ..... Colour Index No. 401
Benzo Fast Scarlet 4BA ..... Colour Index No. 327
Violet FFB ..... Colour Index No. 325

In general, our results agree rather closely with those of Cady. Whereas the use of ½ per cent or even 1 per cent on the weight of the goods of the active ingredient of a particular cationic finishing agent, at a temperature between 90° and 110° F. for 15 min., produced no serious effect on the light-fastness of any of these dyestuffs, the use of the same concentration at from 120° to 160° F. gave a noticeable decrease in the fastness to light. Furthermore, the use of 4 per cent on the weight of the goods at a temperature of from 90° to 110° F. for 30 min. also caused a noticeable change in fastness to light. It must be borne in mind, however, that this concentration corresponds to 8 per cent of the most concentrated cationic finishing agent on the market, and is therefore far removed from practical conditions. When a cloth sample dyed with 1 per cent Direct Blue 4GL is immersed in a solution containing ½ per cent, 1 per cent, 2 per cent or 4 per cent of the same cationic finishing agent at 90° F. for 10 seconds, there is very little effect on the light-fastness and this effect appears to be virtually independent of the concentration of the solution used. In every case, when dark shades were dyed with these colors, the effect on light fastness was considerably lessened either at high temperatures or low temperatures. As might be expected, a higher amount of cationic finishing agent was required to produce a comparable decrease in fastness to light on the heavier dyeings. The increase in the amount of cationic finishing agent required to produce a decrease in fastness to light appears to be roughly comparable to the amount of dyestuff present on the fabric. It can be safely said

that there is virtually no danger in the use of cationic finishing agents on dark shades, whereas on light shades low concentrations of properly selected cationic finishing agent at ordinary operating temperatures, namely 90° F., for example, will not give an appreciable amount of fading.

This effect on the light fastness, slight though it is under practical conditions, may be lessened in one of two ways; First, we may prevent the finishing agent from reacting with the dyestuff by causing it to react with a substance for which it has more affinity than for the dyestuff. In other words, we may add anionic materials to the solution of cationic material until most of the cationic material has reacted. This reduces the amount of cationic material free to react with the dyestuff. There are several objections to this:

1. An incipient precipitation occurs, which may lead to difficulties from spotting and streaking.
2. The actual exhaustion is decreased materially.
3. There are cheaper methods for preparing wax emulsions.
4. There is a better way of decreasing the effect on light-fastness.

On the other hand, materials may be added which will prevent the finishing agent from reacting with the dyestuff, but which do not form insoluble salts as in the above case. These materials may best be classed as inhibitors. It was at first feared that these inhibitors owed their effect to the fact that they decreased the exhaustion. Further examination showed, however, that the extent of exhaustion was actually increased. By the use of such an inhibitor, even the most critical tests may be met satisfactorily, without impairing the finishing effect.

It is very much to be regretted that, in the promotion of some of the so-called substantive softening agents, claims have been made which unfortunately are not completely true. For example, recent advertising matter has referred to "substantive" softening agents which will not affect the light fastness of any dyestuff and will not change the shade of dyestuffs. As a matter of fact, many dyestuffs are changed in shade by these particular finishing agents, excessive concentrations will produce a reduction in light fastness, in the same way in which a reduction in light-fastness is caused by all other cationic finishing agents when used in excessive amounts, and they may not be regarded as being truly substantive. There have been other examples in the past few years of turgid advertising claims being made for inferior products with the result that in many cases the behavior of these materials has been taken as an indication that all cationic finishing agents possess the same faults which are attached to these products. It must be conceded that there are differences between the behavior of cationic finishing agents and the older types of sulfonated oil finishes, but there are numerous uses for which they are so ideally suited that comparable effects cannot be obtained by the use of any other type of finishing agent, and no serious difficulties in application are encountered if a well-balanced cationic finishing agent is applied in the proper manner.

Most of the so-called ply fabrics are finished with much better results by the use of cationic finishing agents than is possible by the older types and at a considerable reduction in cost and increase in output. We are all familiar with the widespread success in the finishing of fabrics of this kind, as well as in finishing printed rayon fabrics and the like. In addition, by the use of these agents it is possible to obtain unique and attractive effects on napped tubular knit goods or on cotton pajama cloth. We feel that in years to come they will find even more uses and that they will enlarge their general value in textile processing.

REPORT, NORTH CAROLINA STATE COLLEGE STUDENT CHAPTER

ON January 29, P. J. Wood, Past President of the Association, spoke to all students of dyeing and finishing on "Penetrants," "Strippers," "Water Soluble Resins," "New Types of Printing Gums and Their Application," and "Textile Finishes," explaining manufacture and application of each product, and giving laboratory demonstrations.

On January 31 and February 1, Sidney Edelstein, Development Manager for the Hart Products Corporation, lectured on "Mercerizing," and described methods of analyzing the finished goods, especially those being made for the army and navy.

On February 7 and 8, Frederic Dannerth, Director of Textile Printing for Frederic H. Levy, Inc., gave a series of interesting talks on "Pigment Dispersions" to Juniors and Seniors in the dyeing courses, showing on a variety of samples, the effects of pigment dispersions on various fibers.

Respectfully submitted,
GEORGE A. FUNDERBURK, *Secretary*.

TECHNICAL PROGRAM, ANNUAL MEETING

PRESIDENT CARL DRAVES has announced the appointment of Kenneth H. Barnard, Chief Chemist for Pacific Mills, Print Works Division, Lawrence, Mass., as Chairman of the Technical Program Committee for the Annual Meeting next Fall at Pinehurst. Dr. Walter M. Scott handled this assignment last year in New York in a most successful manner, following Dr. Draves who had previously been chairman of this committee for six years. Although Mr. Barnard has not announced his plans, it is understood that the Inter-Sectional Contest will be held Friday afternoon, October 31st, and that Saturday morning will be devoted to individual technical papers, possibly divided into two groups. Prizes amounting to $100.00 will be offered for the best inter-sectional papers and the rules, under which the contest was conducted last year, will be published in the near future and the chairmen of the various sections will also be notified. Any suggestions in

regard to the contest or offers of individual papers, will be welcomed by Mr. Barnard.

ONE HUNDRED AND THIRTY-FIRST COUNCIL MEETING

THE Council held its 131st meeting at the Engineers' Club in Boston, on Friday morning, February 14, 1941. Present were President Carl Z. Draves presiding; Roland E. Derby, Vice-President; Albert E. Sampson, Acting Treasurer; Louis A. Olney, Chairman of the Research Committee; William H. Cady and P. J. Wood, Past Presidents; Dexter R. Kneeland and Clarence L. Nutting, representing Northern New England; Frederic A. Prisley representing Rhode Island; Harold W. Stiegler representing New York; William Ebersold, Charles A. Seibert and William A. Stringfellow, representing Philadelphia; Robert W. Philip, representing the Southeastern Section; Bertil A. Ryberg, Associate Research Director; and Harold C. Chapin, Secretary.

The Secretary's report of the 130th Council meeting and balance sheet of February 8, and the Acting Treasurer's report of February 14, were accepted. Thanks were voted to the New York Section for donating its profits from the General Meeting to the Research Fund, as reported in the balance sheet; these being in addition to the registration fees due the Association, which were received and reported at an earlier date. A report from the Treasurer of the Mid-West Section was approved.

Plans for the General Meeting of October 31 and November 1, in Pinehurst, N. C., were outlined by Mr. Philip on behalf of the Piedmont Section, and were approved. The date of the next Council meeting, in Washington, was changed to April 26, that it might follow the Knitting Arts Exhibition in Philadelphia.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

Senior

J. M. Abernathy	R. D. Harvey	W. E. Reid
C. B. Armstrong	L. L. Heffner	H. Richardson
A. G. Ashcroft	F. Holschneider	E. Schlaginhaufen
M. H. Baker	C. H. Huggins, Jr.	I. Schwartz
J. W. Barineau	H. M. Jackson	L. J. Sheps
R. J. Bowman	L. L. Jones, Jr.	M. A. Sieminski
G. H. Boyd	B. J. Lanza	P. E. Smith
C. Bradley	P. Logue	J. J. Solodyna
E. F. Britt	R. A. Lukens	E. G. Sutcliffe
B. D. Browder	W. F. Macia	P. Swartz
J. F. Byrd	J. L. McGowan	A. C. Tacy
J. H. Carey	T. F. Malloy	W. R. Tornquist
M. D. Casapulla	L. E. Moggio	A. T. v. Huben
C. H. Casper	C. B. Musgrave	G. G. Wellworth
M. L. Chandross	A. B. Owens	K. Wenzel
L. F. Cowan	H. H. Pacht	A. T. Wilson
H. C. Gass	J. A. Peel	L. Wolf
W. Gutig	D. Price	L. J. Workman
W. J. Harrison	P. P. Raman	W. R. Zimmerle
	A. J. Ramonda	

Junior

J. J. Black	J. C. Freel	F. R. Sheldon
J. C. Brooks	W. G. T. Mepham	J. E. Turner
P. T. Choate	M. E. Nestler	R. E. L. Winston
A. S. Davis	R. W. Nock	

Associate

P. T. Baxter	C. S. Humphrey	H. Stein
H. C. Brown	J. V. Montgomery, Jr.	F. R. Thus
J. W. Haught		R. M. True
W. F. Henderson	C. A. Ross	J. B. Tuttle
	R. Seiferheld	

Student

N. B. Armitage	C. W. Bachman	C. D. Sickerott
	M. Schlesinger	

Continental Mills, Inc., of Philadelphia, were elected to Corporate membership.

The following were transferred from other classifications to Senior membership: J. T. Bohannon, Jr., R. J. DeWitte,

SECRETARY'S BALANCE SHEET—FEBRUARY 8, 1941

	Applications	*Dues, Regular and Reinstatement*	*Dues, Corporate and Sustaining*	*Miscellaneous*	*Bank Charges*	*Totals*
Brought forward, and received by Secretary, Aug. 1 to Nov. 30, 1940	$820.00	$7,056.50	$1,785.00	$1,102.28	—$.75	$10,763.03
Received by Secretary, Nov. 30, 1940, to Feb. 8, 1941	420.00	3,656.50	610.00	1,882.25*	—1.72	6,567.03
Total received	1,240.00	10,713.00	2,395.00	2,984.53	—2.47	17,330.06
Transmitted to Treasurer	1,240.00	10,433.00	2,395.00	2,984.53		17,052.53
Leaving to order of Secretary		280.00			—2.47	277.53

Miscellaneous Items*			
Annual Meeting profits, from New York Section	$1,400.76	Buttons	3.00
Launderometer royalties	90.00	Year Books	207.45
Crockmeter profits	82.48	Knitted tubing	47.10
Crockmeter cloth	18.61	Reporters	22.55
Dyed standards	10.30		$1,882.25

W. A. Haines, J. F. Kirk, G. D. Marrocco, C. G. Stover, R. E. Noyes, H. S. Schenker, and P. G. Wear.

Respectfully submitted, HAROLD C. CHAPIN, *Secretary.*

ONE HUNDRED AND TWENTY-FOURTH MEETING OF THE RESEARCH COMMITTEE

THE 124th meeting of the Research Committee followed the Council meeting in Boston on Friday afternoon, February 14, 1941. Present were Chairman Louis A. Olney presiding, K. H. Barnard, J. R. Bonnar, W. H. Cady, H. Christison, J. N. Dalton, R. E. Derby, C. Z. Draves, W. C. Durfee, W. Ebersold, A. C. Goodings, D. R. Kneeland, D. P. Knowland, G. A. Moran, C. L. Nutting, R. W. Philip, D. H. Powers, F. A. Prisley, B. A. Ryberg, A. E. Sampson, C. H. A. Schmitt, E. R. Schwarz, C. A. Seibert, J. Shanks, H. W. Stiegler, W. A. Stringfellow, B. Verity, W. von Bergen, W. S. Williams, P. J. Wood, and H. C. Chapin, Secretary.

Mr. Barnard submitted a written report upon conferences with physicians on possible methods of investigating the occurrence of dermatitis from textiles. Dr. Powers supplemented this in discussion.

Mr. Durfee discussed color and the development of the Crock-Meter. Mr. Ryberg showed perforated gray cards made from Munsell standards, intended for matching against crock spots viewed through the perforations. These were adopted as tentative standards.

Mr. Seibert discussed pH in relation to the test for fastness of dyed cotton to chlorine, stating that it was the intention of his committee to buffer the hypochlorite solution at a chosen pH. He also described difficulties encountered in constructing an oven to expose dyed acetate rayon consistently to the fading influence of gas burner fumes, and showed more samples to illustrate the advantages of subsequent hot pressing to develop color change in borderline cases.

A report from the Committee on Mothproofing was received from Mr. Bonnar, Chairman. Dr. Stiegler reported progress on revision of tests for water resistance of fabrics. Mr. Derby stated that a new laboratory method of testing fastness to carbonizing was being tried by members of his committee. There was further discussion of possible compromise of U. S. Federal, British and Association standards to form one set of standards for light fastness. Professor Schwarz stated that more papers on the testing of textile finishes were nearly ready for publication, and that through more general trial outside his laboratory, directions were being developed for operation of the Drapemeter.

Mr. Ryberg discussed progress toward adoption of our standard test methods by the American Standards Association, and suggested changes in CS 59-39 of the Federal Division of Trade Standards. Mr. Christison objected to the adoption of the CS 59-39 test for fastness to dry cleaning as a standard of the Association, on the ground that it does not take into consideration the effects of chlorinated hydrocarbons. Mr. Seibert thought that it might be adopted with the understanding that it excludes these, and that another test covering them might be developed later. Mr. Dalton thought the chlorinated compounds damaging only through their formation of hydrogen chloride, so that their effects might be standardized in terms of this. Mr. Schmitt advocated more general specification of dyes by their manufacturers in terms of fastness to Stoddard solvent and chlorinated hydrocarbons respectively.

It was voted the sense of the meeting that Council and Research Committee meetings be restricted to approximately four per year, that they be held on Saturdays except in the week of a General Meeting of the Association, and that the day immediately preceding, in each case, be reserved for meetings of research sub-committees. The Chairman of the Research Committee requested that all sub-committee reports for the 1941 Year Book be in by April first.

Respectfully submitted, HAROLD C. CHAPIN, *Secretary.*

SOUTHEASTERN OFFICERS' MEETING

THE first meeting of the year of the officers and sectional committee of the Southeastern Section was held on February 8th at the Country Club in LaGrange, Ga. Plans were made for the activities of the section for the coming year.

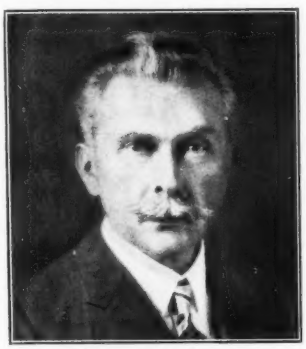
Shown at the right are a number of the officers and sectional committeemen who attended the meeting. At the top left are L. L. Bamberger, vice-chairman, and Robert W. Philip, councilor; just below is R. J. McCamy. At the top right are A. R. Macormac, treasurer, and M. T. Johnson. At the bottom left are George L. Dozier and Joe W. Richardson; at bottom right are Curt Mueller, secretary, and W. C. Hunter.

Not shown in the photos, but present at the meeting, were Perrin N. Collier, chairman, George E. Missbach, W. B. Griffin, and John P. Harrison.

OBITUARY

ERNEST O. PATZ

ERNEST O. PATZ, president of the Nyanza Color and Chemical Co., Inc., died on March 7th at White Plains, N. Y., Hospital of pneumonia after a week's illness. He was seventy years old. His home was in Scarsdale, N. Y.



Ernest O. Patz

Mr. Patz was also president of the Franklin Import and Export Company and of the Chemical Manufacturing Co., Inc.

Mr. Patz was born in Oelsnitz, Saxony, Germany, studied at the Real-gymnasium at Plauen and then underwent an apprenticeship in the woolen and worsted business. He was later associated with a textile mill in Bradford, England and came to this country in 1899 as a representative of the AGFA (Actien-Gesellschaft Fur Anilinfabrikation), doing business in this country under the name of Berlin Aniline Works. He founded the Franklin Import and Export Co. in 1917 and the Nyanza Color and Chemical Co. in 1919.

In recent years Mr. Patz devoted much of his time to raising horses on Mohican Farm at Mamaroneck, N. Y. He also maintained on this farm a wild life sanctuary where wild ducks, Canadian geese, pheasants and other game birds lived or stopped while migrating.

Mr. Patz was a member of the Boulder Brook and Westchester Country Clubs and the Chemists' Club of New York. He is survived by two sisters, his wife having died four years ago.

• ELLEN H. RICHARDS INSTITUTE

In recognition of the generally growing interest in the accumulation of research data which will lead to the improvement of standards of living in the fields of food, clothing and shelter, the Pennsylvania State College has established the Ellen H. Richards Institute as a consolidated working research unit covering some of the investigations formerly carried on in the Departments of Chemistry and of Home Economics and in the Agricultural Experiment Station at the College.

Studies in textile technology, which have been carried on at the Pennsylvania State College in the Department of Chemistry since 1919, will be included in the work of the new institute. These have been concentrated on investigations on the durability of textile articles in relationship to fabric construction and types of dyes, and on methods of laundering and dry cleaning. Research fellowships have been maintained at the college by the Pennsylvania Association of Dyers and Cleaners, the Pennsylvania Laundryowners Association, and the Pennsylvania State-Maintained Institutions of Welfare, Public Instruction, Health and Military Affairs.

The Ellen H. Richards Institute was named for the first woman to receive a degree in chemistry from the Massachusetts Institute of Technology. She is regarded as the founder of household science in this country in its modern sense.

Dr. Pauline Beery Mack, who has been on the staff of the School of Chemistry and Physics at the Pennsylvania State College since 1919 and Director of Research in Home Economics at the college since 1935, will be the first director of the newly-organized Institute.

• GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York City, has released circulars describing the following products:

Fastusol Yellow GA Extra—a direct color which produces on cotton or on rayon bright shades of a fairly greenish yellow. It is said to possess good fastness to light and can be discharged to a very good white with Rongalite C. The product is well suited also for the dyeing of unions. Either at the boil or at lower temperatures, it is said to yield uniform shades on cotton and wool mixtures. Circulars G-226.

Celliton Fast Yellow RRA—a dispersed, direct dyeing color for acetate rayon. It produces bright, fairly reddish shades of yellow said to possess very good fastness to light. It is stated that, due to its excellent affinity and penetration at 160° F., it can be very satisfactorily used for jig dyeing. It is also well suited for direct printing on acetate rayon. It does not sublime under ordinary steaming conditions. Circular G-229.

• ARNOLD-HOFFMAN EXHIBIT

Arnold-Hoffman & Co., Inc., Providence, R. I., will exhibit at the Southern Textile Exposition in Space 464 (Annex). Featured will be Ahcoprint, a new pigment printing base. Advantages claimed for this product are: ease of use; may be used with any standard pigment; gives a soft handle to fabrics; pastes may be kept for long periods; pastes are very stable and will not break down on rolls; no grit and no damage to metal rolls or parts and no action on rubber; pastes will reproduce fine lines and give all the sharpness of detail characteristic of pigment printing; have excellent fastness to light, washing and crocking.

• SOUTH AMERICAN TOUR

The textile industry will be represented in the group of prominent United States research, industrial and banking executives who will make a "tour of industrial exploration" this month to principal South American nations. This was announced from the New York headquarters of the National Research Council under whose auspices the tour is being conducted.

F. A. Williams, president and treasurer of the Cannon Mills Co., New York; C. B. Rockwell, treasurer of the Collins & Aikman Corp., Bristol, R. I.; M. C. Huntoon, president of the Providence Co., Providence, R. I., and H. H. Schell, president of Shelton Looms, New York, are among those who will participate on the trip which will take place in Colombia, Peru, Chile, Argentina, Uruguay and Brazil.

The outcome of more than a year's study of the various aspects of such an undertaking, the tour has been arranged to develop practical methods for the exchange of American industrial technology for non-competitive raw materials produced by South American countries.

The invited participants were selected from more than three hundred research administrators, industrial executives and bankers. Cooperation of various departments of the government charged with the responsibility for inter-American relations has been assured.

• BULLETIN ON SPECIALTIES

A new bulletin on organic chemical specialties, being distributed by E. I. du Pont de Nemours & Company, describes a number of products of the Fine Chemicals Division which are useful in the textile industry and in a wide range of other applications. These include leather manufacture, paper making, metal cleaning and plating, pigment dispersions, cosmetic preparations and others.

Most of the materials covered have surface-active properties, and are used where wetting, cleaning and emulsification are involved. A table listing the various wetting efficiencies is given. Other factors, such as

scouring and emulsifying efficiency, solubility, stability, chemical reactivity, and solvent properties are discussed. Solubilities in the presence of various metal salts are also shown.

The bulletin was prepared as a guide to the proper choice of materials for specific industrial tasks.

• PURCHASE PHILADELPHIA DRYING MACHINERY CO.

The Philadelphia Drying Machinery Company, manufacturers of "Hurricane" Drying and Finishing Machinery, has discontinued business. Their patterns, drawings, engineering data, patents and inventory have been bought by Proctor & Schwartz, Inc., of Philadelphia, builders of "Proctor" Drying Equipment.

The personnel of the Philadelphia Drying Machinery Company has also been taken into the Proctor & Schwartz organization, and will operate as the Philadelphia Drying Machinery Division of Proctor & Schwartz, Inc.

This arrangement will give present users of Hurricane equipment a source of supply for repair parts, additions to their machines, or duplicate machines. Several types of Hurricane equipment will continue to be offered in improved design and construction.

• JOINS MOUNT HOPE

Carol E. Blackler, formerly with the Bradford Dyeing Association of Westerly, R. I., has joined the sales department of the Mount Hope Finishing Company, North Dighton, Mass., owners of the Wat-a-set and Wat-a-tite finishes for cottons and rayons. Mr. Blackler will specialize on sulfur colors, vat dyes and water repellent finishes for outdoor sportswear and work clothes.

• TRADE-NAMES INDEX

As an aid in the difficult problem of identifying and defining the numerous products known and sold under "coined" names or trade-names, the Special Libraries Association announces the publication of a 174-page volume, "Trade-names Index." The volume contains an alphabetical list of 3496 trade-names. For each of these a definition is given and usually a reference to a printed source of further information is cited. In general, the list is concerned with materials, processes, and equipment having some technical significance. In addition to the list of trade-names actually defined, the volume includes a record of more than 100 other lists or sources of further information on trade-names. The volume may be obtained for $4.00 a copy from Special Libraries Association, 31 East Tenth Street, New York, New York.

• LECTURE ON CHEMICALS

Textile chemists and technical employees of the Southern Franklin Processing Company, at Grenwich, South Carolina, recently attended a lecture-discussion on "Sulfated Fatty Chemicals" delivered by Dr. Edward A. Robinson, technical director of the Industrial Division of National Oil Products Company, Harrison, N. J.

Dr. Robinson first outlined the development of sulfated fatty chemicals and then discussed the properties of these chemicals and their application in textile processing.

The importance of adapting the right fatty chemical to the particular process or application rather than merchandising one material and trying to fit it into all processes was stressed by Dr. Robinson.

• NEW ALROPEL CAMPAIGN

Alrose Chemical Co., Providence, R. I., are currently featuring "Alropel," their "weather-wise," moisture-repellent finish. Alropel is claimed to give garments exceptional resistance to fog, rain, sleet, spots and perspiration, without impairing the texture, color, feel or porosity of the fabric. The manufacturer points out that Alropel-treated fabrics offer an unusual opportunity for the retailer to build customer satisfaction and good will.

In finishing operations, too, Alropel is said to offer advantages. It is stated that its emulsions, being very stable, do not foam or break down readily. Hence, there is no trouble with spots or stains. Alropel is simple to apply by one-bath method and fabrics so treated may be calendered with out impairing their water-repellency. Attractive new tags identify Alropel-treated fabrics and enhance their sales appeal. Samples of Alropel are available for testing purposes.

• A. I. CH. E. MEETING

"Canada's Industrial Front" will be the subject of an address given before the New York Section of the American Institute of Chemical Engineers, on Wednesday, March 26, at 8:00 p.m. at the Chemist's Club, 52 East 41st Street, New York, by Floyd S. Chalmers, Editor of the "Financial Post" of Toronto, Canada's leading newspaper of business.

Mr. Chalmers will analyze the industrial contribution Canada is making in the present World War; will review the changes that have taken place in Canada's business and economic life, including war finances, and will discuss the manner in which war contracts have been allocated to Canada.

The regular meeting of the New York Section will be preceded by a dinner at 6:30 p.m. Non-members of the Institute are cordially invited to attend both the dinner and the meeting.

The newly elected officers of the New York Section of the American Institute Chemical Engineers are: Chairman, Walter J. Murphy, editor, Chemical Industries; Vice Chairman, Harry E. Outcault, St. Joseph Lead Co.; Secretary and Treasurer, Ray J. F. Kunz, Cooper Union.

• NEW RESIN FINISH

Aerotex No. 301, a new emulsion blend of resins, has recently been announced by the Calco Chemical Division, American Cyanamid Company. The most important application of this new finish, according to a bulletin issued by Calco is for producing a soft and supple hand on spun rayon and spun rayon mixed fabrics. It is claimed that these hands are "lively" in contrast to the decidedly dull and lifeless hands produced with other finishing materials.

According to this bulletin, Aerotex No. 301 requires no boiling as in the case of other finishing mixes. This saves time and eliminates a messy step.

The permanency of this finish is said to be unusually good. Results of tests show that after ten commercial launderings goods finished with Aerotex No. 301 have a 65 per cent retention of the finish. According to this bulletin, Aerotex No. 301 requires no accelerator. Stability of this product is good since it is possible to keep it stored for two months or longer. It is stated that tests have proved that laundry chlorine bleach does not affect this product in the same manner as even formaldehyde products. Absorption of chlorine is insufficient to cause tendering in subsequent laundering.

Copies of this bulletin on Aerotex No. 301 may be obtained from Calco at Bound Brook, New Jersey.

• FORTIETH ANNIVERSARY

Morley Hey Carpenter completed forty years of service on March 5th with Andreykovicz & Dunk, Incorporated, Philadelphia, which concern has been in the dyestuff business continuously under the same name for 78 years.

Well known as "Carp" among the chemists and dyers of the East, a dinner in his honor was given by fellow-employees at The Union League of Philadelphia. The average length of service of all the employees present was 23 years and this was commented upon by the president of the company as he presented Mr. Carpenter with gifts from the employees, the board of directors, and floral tributes from many friends.

Mr. Carpenter continues his activities in the laboratory which he has helped to build and expand through many years.

• MODINAL D PASTE

It is stated that elimination of the second rinsing process formerly necessary in fulling and scouring piece goods has been made possible by a product recently developed in the laboratories of E. I. du Pont de Nemours & Company.

Use of the new product, which has been called "Modinal" D Paste, is said to reduce the time necessary for scouring by about forty minutes. It was pointed out that this saving of time may be important in those mills working on national defense orders.

Recommended procedure with the new product is a two-step scouring and rinsing operation after fulling. It applies equally as well to colored and undyed goods. It is particularly indicated for low-grade fabrics containing dirty and reworked wools. The first step is to scour with fulling soap as usual and rinse moderately. In the second step where the new bath is employed, add one-half per cent "Modinal" D Paste and scour for fifteen to twenty minutes and then rinse. The amount of paste may be reduced if the goods are clean and it should be increased if the goods are very dirty.

Advantages claimed for "Modinal" D Paste are as follows: It reduces the possibility of blotchy dyeing; insures a cleaner odor; provides a saving in steam by use of colder water in rinsing; reduces time of rinsing to neutrality, and provides a safety factor where conditions vary, such as hardness of water, volume of water available, and temperature of water.

An alternate procedure, used when a second scouring is not essential, consists of adding one-fourth to one-half per cent "Modinal" D Paste directly to the scouring bath. Although the full benefit is not realized with this process, a substantial improvement in time of rinsing, uniformity of dyeing, and odor of goods is said to be realized. This method applies not only to high-grade woolen goods, but also to very cheap fabrics where processing cost must be reduced to a minimum. It is employed both on colored goods and fabrics before dyeing.

• ANNUAL MEETING, N. F. T.

At the sixty-eighth annual meeting of The National Federation of Textiles, Inc., held recently in the headquarters of the association at 15 West 37th Street, the following were elected as directors for the ensuing year: Ward Cheney, Cheney Brothers; G. H. Conze, Susquehanna Silk Mills; Jarvis Cromwell, Wm. Iselin & Company, Inc.; W. H. Hubbard, William Skinner & Sons; Alexander F. Ix, Frank Ix & Sons, Inc.; Wm. G. Lord, Galey & Lord, Inc.; Wm. Olmsted, American Viscose Corporation; J. W. Schwab, Cohn-Hall-Marx Company; James E. Shields, J. P. Stevens & Company, Inc.; Henry E. Stehli, Stehli & Company, Inc.; A. D. Walker, A. D. Walker & Company; Jacques Weber, Bloomsburg Silk Mill and A. E. Wullschleger, Wullschleger & Company. Mr. Olmstead and Mr. Weber are new members of the Board.,

The Uptown Credit Group of the Textile Industry (an affiliate member of the Federation) announced, at the same time, that T. B. Luse of Commercial Factors Corporation had been elected to represent the Group on the Federation Board for the ensuing year.

At the meeting of the newly elected Board of Directors following the members' meeting, the following officers were elected to serve for the ensuing year: G. H. Conze, President; Wm. G. Lord, Vice President, and I. L. Blunt, Secretary and Treasurer.

In addition to election of directors, the members approved a report from the Secretary on organization activities for 1940 and a statement of the financial position of the association.

• TWO NEW FABRICS

Du Pont Spun Rayon combined with wool is being used in two new fabrics distinguished by an unusual dyeing technique just announced by Sea Island Mills, Inc., 53 Worth Street, New York City.

The fabrics are a flannel and a gabardine. The manufacturer states that this is the first time that vat dyes have been successfully used on wool content fabrics and that their new technique has succeeded in not only uniformly vat dyeing a rayon and virgin wool blend, but in producing fine fabrics that have passed all color fastness tests by the Better Fabrics Testing Bureau. In regard to the tests, the manufacturer states that the flannel passed 150-hour Fadeometer tests.

Washing tests, they state, at 200° F. resulted in practically no color change from original samples. Shrinkage, they say, is not over 2% residual.

In the case of the gabardine, it is stated that the rayon and virgin wool blends passed all tests with "good" and "excellent" rating These tests, it is said, were equal to those required for venetian blind tapes and awning tests where severest conditions are encountered.

Du Pont vat dyes have been used in deying these fabrics.

It is expected that the new materials will be seen during Summer, 1941, in men's and boys' sportswear, women's sports and tailored wear and children's clothes. The new fabrics come in a complete color range.

• BOOK ON SOAPS

A book which contains complete information on numerous metallic soaps, has been published by the Metasap Chemical Company, a subsidiary of the National Oil Products Company, Harrison, N. J., it was announced by G. D. Davis, official in charge of research.

Compiled primarily for technical men engaged in either pure or industrial research, the book, entitled "Metallic Soaps," contains convenient data on the standard, well-known metallic soaps, as well as some not so commonly known.

In the preface is pointed out that "up to the present, metallic soaps, due to their unique behavior in various organic solvents, waxes, resins, and oils, their water repellency, and gelling properties, have enjoyed widespread use in grease making, pigment suspension, cosmetics, mould lubrication, waterproofing, cement treatment, lacquer flattening, and many other applications."

The book is divided into chapters dealing with metallic soaps in common use, metallic soaps less commonly used, metallic soaps in industry and an analysis of metallic soaps. Other chapters deal with Metasap specialties, patent literature on the subject, a bibliography and an addendum.

A chart designed for use in the laboratory, listing the properties of all metallic soaps, is included with the book.

The book was prepared by the Market Development Department of the Metasap Chemical Company in collaboration with Francis J. Licata, Chief Chemist.

• MEETING, S.O.C.M.A.

The Synthetic Organic Chemical Manufacturers Association of the U. S. held its regular monthly luncheon meeting at the Chemists Club, New York City, on Tuesday, February 11th.

It was announced that the association's annual spring outing would take place this year on June 5th and 6th at Skytop Lodge, Skytop, Pa. The S.O.C.M.A. will be the host at the annual union dinner of the S.O.C.M.A. and the M.C.A.

• KNITTING ARTS EXHIBITION

The thirty-seventh annual Knitting Arts Exhibition will be held at the Commercial Museum, Philadelphia, Pa., on April 21st, 22nd, 23rd and 24th. It is held under the joint auspices of the National Association of Hosiery Manufacturers and the Underwear Institute. Advance reservations indicate that another successful trade show will result this year.

The Annual Knitting Arts Exhibition Number

of the

AMERICAN DYESTUFF REPORTER

will appear on

APRIL 14, 1941

ELECTROCOATED PILE FABRICS*

N. E. OGLESBY and L. E. HOOGSTOEL**

The electrostatic process as applied to the manufacture of pile fabrics is described. The success of the process in sandpaper manufacture indicated its possible usefulness in textiles. Two types of textile products are being manufactured commercially by the electrostatic process: women's dress goods decorated with a pile design, and an all-over covered pile product for such service as car interiors and upholstery. Many of the problems relating to the manufacture of pile fabrics by the electrostatic process are discussed.

The success of the process as applied to textiles is dependent upon accurate control of fiber length, type of adhesive, and humidity conditions of manufacture. The type of current used is also important. The relative merits of alternating and direct current are pointed out.

The outstanding feature of a pile fabric manufactured by the electrostatic process is the density of pile attainable, which reflects in the wearing properties of the product so made. As high as 275,000 fibers per square inch are obtained. Other fields of application for the electrostatic process are discussed.

THE development of electrocoated pile fabrics was an outgrowth of the development of electrocoated sandpaper. The development of electrocoated sandpaper, pioneered by the Behr-Manning Corporation, was described by D. H. Killeffer[1]. While the process as developed for electrocoating sandpaper is quite simple in its final form, extensive experimental programs were carried out over a period of years—that is, from about 1926, before the present relatively simple method was developed. The final arrangement is illustrated in Figure 1. An adhesively coated backing is fed continuously between a pair of electrodes, *A* and *B*, with the backing adjacent to the upper electrode and with the adhesively coated side facing downward. Abrasive grains are fed between the electrodes by a continuously moving belt which travels adjacent to the lower electrode, *A*, with the grain on the belt facing the adhesively coated backing. One electrode is grounded while the other is connected to a source of high potential. The potential is usually of the order of 10,000 to 25,000 volts per cm. of electrode spacing. The abrasive grains are charged with the sign of the bottom electrode, stand erect with their long axes parallel to the lines of force between the two electrodes, and, when sufficiently charged, are propelled to the adhesively coated backing sheet and are embedded in the adhesive with their long axes perpendicular to the backing sheet. Furthermore, since the grains are charged with the same sign, they repel one another and are for this reason uniformly distributed on the backing sheet. When abrasive grains are so located under the influence of an electrostatic field, it has been found that a much more efficient abrading tool is produced. This is because the sharp points are in a position to engage the work more effectively and because the grains, being uniformly spaced and standing upright, do not tend to become packed or loaded with the abraded material to the extent that a random or unoriented abrasive coating becomes loaded in use and therefore relatively ineffective as an abrading tool.

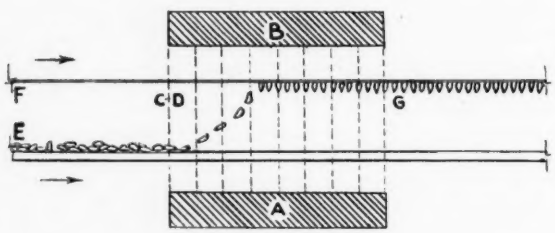


Figure 1. Electrode Arrangement for Electrocoating Sandpaper

A. Negative electrode.
B. Positive electrode.
C, D. Lines of electrical force.
E. Conveyor belt carrying loose grain.
F. Paper with glue side down.
G. Abrasive grain embedded vertically in glued surface.

At a fairly early date in the work on sandpaper it was recognized that the electrocoating methods developed should have other applications, and a few sporadic experiments were run in which an effort was made to orient textile fibers to form simulated pile fabrics. The fact that many of the operations incident to the manufacture of a woven pile fabric would be eliminated by the use of the electrostatic method, impelled us to give serious consideration to such an application. These early experiments indicated that any real commercial success in forming pile fabrics would have to be preceded by the solution of a number of problems. For instance, a substantially constant potential on the coating electrodes was quite effective in the coating of sandpaper and was used for this purpose. When, however, textile fibers were fed to the same field in the same way that abrasive grains were fed, the fibers treed or matted in loose form between the electrodes and thereafter failed to respond to the field as required for coating. That is, even with a constant potential on the electrodes, as the grain and adhesive-coated backing passed through the electrodes, the grains repeatedly rose to the backing, returned to the belt, and were again propelled to the adhesive-coated backing until the desired coating had been built up. There was an absolute absence of the treeing and inactivity of abrasive

*Presented at the Detroit meeting of the American Chemical Society. Reprinted from, and cuts through courtesy of, Industrial & Engineering Chemistry.

**Behr-Manning Corporation, Troy, N. Y.

[1] *Ind. Eng. Chem.*, 29, 849 (1937).

particles that were found in attempting to coat textile fabrics.

METHODS OF COATING TEXTILE FABRICS

In general, one of two methods is used—a pulsating or interrupted direct potential, or an alternating potential. Of the two, the latter is preferred. Under the influence of an alternating potential the sign of the charge on the electrodes and on the particles is repeatedly reversed so that the particles bounce backward and forward between the electrodes without treeing and becoming inactive as is the case where an unvarying unidirectional potential is impressed upon the electrodes.

There is another important difference between abrasive grains and textile fibers. Abrasive grains are dense, nonabsorbent, and relatively unaffected by moisture. Textile fibers, on the other hand, may absorb large quantities of water and vary decidely in their electrical characteristics, depending upon their water content. Successful coating of pile fabrics by the electrostatic method, therefore, requires that there be reasonable control of the water content of the textile fibers. Furthermore, as in all textile work, it is desirable that there be some control of humidity.

In order to obtain good coatings of highest density and uniformity of appearance, the textile fibers should be cut to uniform lengths. This is a sizable development in itself. Furthermore, aside from the effect on density of coating, the cutting of the fibers to uniform length is more economical than subsequently shearing nonuniform coated fibers to obtain a level pile surface effect.

As indicated, the uniformity of cut must be controlled in order to facilitate the manufacture of pile fabrics by the electrostatic method. This control is attained by repeated testing during the cutting operation which consists in making distribution curves of the fibers as cut. A typical satisfactory distribution curve and an unsatisfactory one are shown in Figure 2. Material made with fibers represented by the distribution curve *A* would require no shearing, whereas material made with fibers represented by curve *B* might require shearing in order to get a level pile.

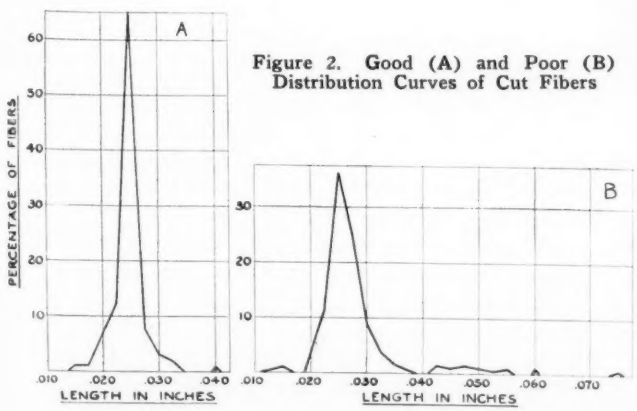


Figure 2. Good (A) and Poor (B) Distribution Curves of Cut Fibers

The first commercial use of the electrocoating process in the formation of pile fibers was in the manufacture of dress goods sold under the name "Fibredown". The Behr-Manning Corporation did not wish to go into the dress goods business and therefore licensed another company to manufacture and sell goods under the patents and applications covering the processes developed by the Behr-Manning Corporation. Figure 3 shows typical Fibredown patterns.

In running goods of the Fibredown type the adhesive is applied with a stencil or other means in the form of the pattern desired, the fibers are electrostatically propelled into the adhesive, and the adhesive is cured in conventional festoons. A number of fibers may be used —for instance, cotton or rayon. As previously pointed out, they are cut to uniform length before the coating operation, and may be either dyed or undyed. So far, Fibredown has been sold with white fibers only, but an assortment of colors will be offered at an early date.

The adhesive development was an important part of the problem. Dress goods of the type under consideration must be able to stand either reasonable laundering or dry cleaning, and repeated ironing. That the adhesive should stand reasonable laundering is quite a rigid specification, but that it must stand normal ironing without appreciable loss of loft or color make the task doubly difficult. Since white patterns are very popular, initial color and color retention of both the fiber and the adhesive are of primary importance. A number of desirable adhesives are automatically eliminated because they are

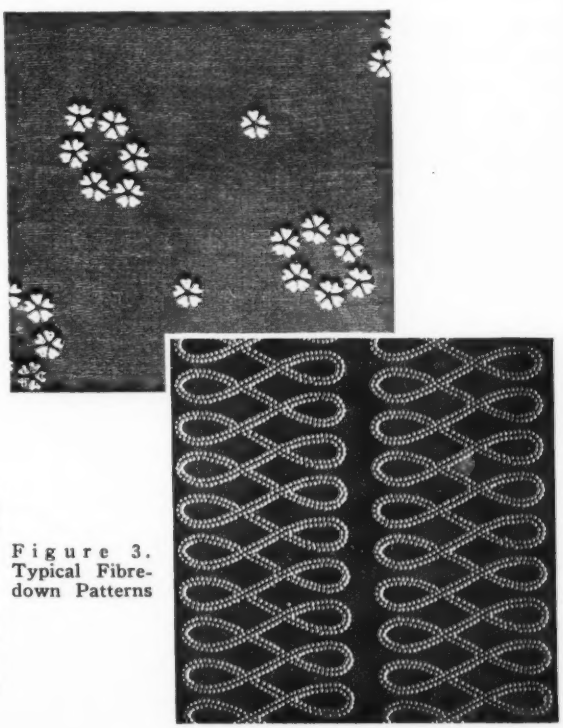


Figure 3. Typical Fibredown Patterns

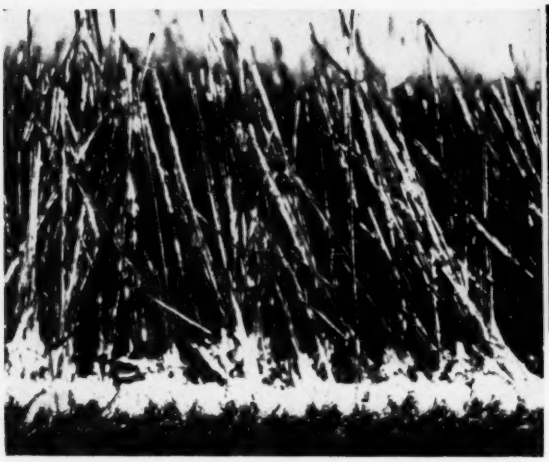


Figure 4. Cross Section of Electrocoated Pile Fabric

thermoplastic and cannot be subjected to the normal ironing operation. Since a number of patents covering the whole development are still pending, we are not at liberty to disclose a number of the details of the process. In general, however, certain synthetic resins have been found to be the most desirable bases for adhesive compositions.

During the early stages of the experiments many trial dresses were worn by women in our organization; these were carefully checked from time to time, and it was found that the material as developed would meet all the specifications we had set out to meet. As a matter of fact, these particular garments received more rigid tests than most would have received, since a studied effort was made to subject them to the worst laundering practices.

PILE FABRICS

The Behr-Manning Corporation has developed and manufactured on a small scale, a product called "Norzon". It has a reinforcing backing of cotton cloth to which is applied a dense all-over pile of electrically oriented fibers held to the reinforcing backing by an adhesive layer interposed between the backing and the pile. This product is intended particularly for such uses as lining the side walls of automobiles and for other upholstery uses.

Figure 4 shows a section of the oriented pile and backing. To form the dense coating, about 275,000 fibers are applied to each square inch of backing. This high density of fibers anchored to the backing forms a product with exceptional resistance to wear. In tests carried out on a number of machines, such as the Wyzenbeek, the U. S. Testing Laboratory, the U. S. Bureau of Standards, and the Shawmut machines, it was found that the electrocoated product is superior to woven pile fabrics picked up in the trade and used as controls. The product has not been available long enough to determine its useful life in practical installations. Figure 5 shows the

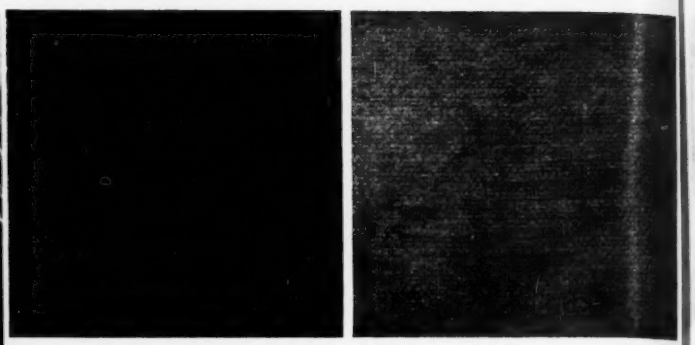


Figure 5. Appearance of Electrocoated Pile Fabric (left) and of Woven Pile Fabric after 10,000 Strokes

appearance of the electrocoated pile fabric and of a woven pile fabric after 10,000 strokes on the U. S. Testing Laboratory machine.

Practically all good textile fibers can be applied by the electrocoating process. Because of the present price situation on wool, much of our time has been spent on developing superior products with rayon fibers. As in the case of Fibredown, all fibers should preferably be cut to uniform lengths before coating. The length of the fibers may be varied within rather wide limits, depending upon the result desired. The lengths most frequently used in making this type of product have varied from 0.025 to 0.060 inch.

The product illustrated in Figure 5 (which we have generally had in mind in this description) is made with a specially compounded latex adhesive. Where greater resistance to dry cleaning fluids is desired and the customer wishes to pay the difference in price, synthetic rubbers such as neoprene may be substituted. Where a flexible, rubbery adhesive is not required, other types of adhesives, such as varnishes and lacquers, have been successfully employed.

In so far as patterns and designs are concerned, Norzon lends itself effectively to the application of patterns by printing methods. This is not the only means of obtaining patterns on Norzon, but it is particularly adaptable to taking printed designs. The dense vertical pile prints without smearing.

Norzon has been made in widths up to 36 inches, and it is hoped that widths up to 58 inches can be made on larger scale equipment now ready for operation.

Another project is that of making carpets by the electrocoated method. The most important difference between electrocoated carpets and Norzon as prepared for automobile side walls will be in the fibers themselves, both as to coarseness and length. In making small-scale runs of carpet material up to this time, we have used a specially treated burlap base and fibers from about 0.150 to 0.250 inch long. Encouraging results have been obtained, and it is hoped to complete this development on a larger scale at an early date.

• TECHNICAL NOTES FROM FOREIGN SOURCES •

The Use of Stainless Steel in the Dyeing and Finishing Industry

J. W. Grayson—J. Soc. Dyers and Col., 56-209, *May*, 1940.—Stainless steel, as originally introduced in 1914, was an alloy containing 12-14 per cent of chromium and about 0.3 per cent of carbon, and as such is still in use as cutlery, though because of its toughness and lack of ductility it is not employed in this form in textile machinery. The corrosion-resisting value which it possessed, however, led to further experiments aimed at increasing the possibilities of such an alloy's use. It was found that if the carbon content was reduced to not more than 0.15 per cent the ductility was greatly increased. This type was known as stainless iron, and even in the unpolished state was quite resistant to corrosion in presence of moisture.

	Carbon	*Chromium*	*Nickel*	*Tungsten*	*Titanium*	*Molybdenum*
No. 8	0.15	18.0	8.0	0.5-1.0	0.5-1.0	—
No. 9	0.07	18.0	8.0	—	—	2.5-4.0
No. 10	0.07	18.0	10.0	—	—	1.0-1.5

Stainless iron, though an improvement from the fabricating point of view, still did not meet the requirements of the chemist, and experiments to produce something better were continued. By 1919 there emerged a further group of steels which contained nickel in addition to chromium, and which can be loosely classified as the austenitic or non-magnetic steels; the straight chromium or martensitic type is magnetic. The first austenitic stainless steel, containing 0.15 per cent carbon, 18.0 per cent chromium and 8.0 per cent of nickel, was found to possess qualities which made it much more amenable to many manipulative processes than former types, while at the same time its resistance to corrosion, even against acids, was much greater. It was found, however, that after certain operations, particularly welding, the stainless properties had been seriously affected.

The subject of weld decay is one of considerable importance. Upon examination of such affected areas under the microscope it becomes evident that a disturbance has taken place in the metal structure, thought to be due to the precipitation of chromium and other carbides along the crystal boundaries. The theory generally held is that this precipitation of the carbides leaves certain zones starved of the essential chromium and thus prone to attack in these areas. To prevent this fault the addition of tungsten to the alloy was tried, with some improvement, but complete success was achieved only when titanium was also added. Molybdenum in place of the tungsten and titanium was also found to prevent the harmful carbide precipitation.

In general, four classes of stainless steel are recognized: the straight chromium type containing about 0.3 per cent carbon, which is used for cutlery; stainless iron, containing only 0.15 per cent or less carbon; nickel-chromium steel, utilized where welding and other heating operations are not required; and the class containing nickel-chromium plus tungsten and titanium, or with molybdenum, which can successfully withstand welding without subsequent heat treatment. It is this last class with which the dyeing industry is chiefly concerned.

The author discusses in considerable detail the methods employed in making up vessels or containers of this material, and its special application in such machines as winches, jiggs and other forms of dyeing apparatus, many of which are illustrated by photographs. From an accompanying table of stainless steel analyses the following percentage figures are taken:

The Production of Crude Glycerine in Soap Manufacture

J. H. Trebictz—Fette u. Seifen, 47-59, *Feb.*, 1940.—Although in the early days of soap making there was little attempt to recover glycerine from the spent soap lye, by the beginning of the present century the larger manufacturers were taking steps to avail themselves of a new separation process which was then coming into favor. As demand for the product increased, accompanied by correspondingly better prices, in course of time more efficient methods of handling the spent lye were perfected, including the modern multiple-stage evaporators now used in concentrating. The author believes that some readers may be interested to learn by what simple means glycerine was reclaimed at about the turn of the century, and gives a brief account of the process employed in his own experience as a soap manufacturer.

In 1895 he was in charge of a Finnish plant which made soap from such materials as palm oil and tallow, and as the spent lye contained a considerable quantity of glycerine, its reclamation was undertaken with such apparatus as was readily available.

After removal of the soap curd the residue liquor was brought to the boil and excess alkali neutralized by addition of rosin or olein, the soap so formed being then salted out. More olein was next added with continued heating, and the salting-out repeated. The liquor was then led into a large container in which impurities could settle and the soap curd be removed. After this it was again heated by steam in a wooden tank, and muriatic acid added with constant stirring until the liquid was just acid to litmus. A tarry scum which separated at this point was removed and milk of lime added to faint alkalinity, or until a small test portion filtered clear and remained clear on boiling.

The liquor was now allowed to stand until various impurities had subsided, after which it was filtered and evaporated by means of a steam coil. Salt which separated out was removed and drained, and the mother liquor re-

turned to the main portion. The solution was then neturalized with acid and evaporation continued until the product showed a specific gravity of 1.3 at 15° C. For further purification the crude glycerine was then diluted with an equal amount of water, again neutralized with sulfuric acid and filtered, again concentrated and given a final filtration. The author's notes record that by this process a yield of 2200 kg. of glycerine was secured from 24,000 liters of spent lye handled.

Azoic Colors—Improved Fastness to Rubbing on Piece Goods

E. R. Wiltshire—J. Soc. Dyers & Co., 56-254, *June,* 1940.—The problem of fastness to rubbing, perhaps the oldest in connection with dyeing azoic colors, remains in most dye houses one of such importance that any contribution towards solving it is particularly welcome. For this reason the author hopes that the present paper will prove of some practical interest and value for those who use Brenthols (Naphthols) and allied products in dyeing piece goods.

Fastness to rubbing is not an inherent property of any azoic dye, as is, for instance, fastness to light. Though the correct choice of a suitable azoic compound is indispensable, the degree of rubbing fastness depends also upon other factors, including the type of material to be dyed, depth of shade required and dyeing method adopted. Certain uncontrollable factors, such as depth of shade and type of material, may set low limits to the degree of rubbing fastness that can be obtained by even the best-known methods of manipulating the controllable factors; the most that can be done in such cases, recognizing the limitations of the type of dye, is to adopt the best available dyeing method for piece goods and to select the most suitable azoic combination.

In the practical investigation made by the author to determine the best method of dyeing, the merits of both jig and padding machine were carefully examined. Though this work was carried out in the laboratory, a miniature jig and padder being employed, dyeing conditions were adopted which could be imitated in bulk in all their essential features, so that a dyeing process established on the laboratory apparatus could be transferred to bulk working without alteration, except in proportion, to give the same result as regards both rubbing fastness and shade. The materials selected for trial were tightly woven mercerized poplin and caustic-shrunk dress linen, types which in practice commonly give considerable trouble as regards rubbing fastness.

It was found that there is no one universal cure for poor rubbing fastness, but that every single stage of the dyeing process can have some effect in determining the final result. The dyeing method finally established as the best is therefore a combination of all the methods of procedure found to give the best result at each stage of the process.

These various steps in the dyeing process are discussed at some length. They are listed as: (1) Pretreatment of the Material; (2) Dissolving the Brenthol; (3) Impregnation with the Brenthol; (4) Treatment of the Goods Between Impregnation and Development; (5) Development; (6) Acid Rinsing After Development; (7) Soaping Aftertreatments; (8) Rinsing.

Under the different headings the author stresses the necessity of efficient scouring if dyeing is to be carried out on unbleached material, the use in dissolving the Brenthol of products of the Lissapol LS and Dispersol L type instead of Turkey Red Oil, impregnation with the Brenthol on a jig rather than on a pad (the process being started at b.p. and continued in a cooling bath to 50° C. to insure the best possible exhaustion), an efficient mangling to remove as much as possible of the mechanically held Brenthol liquor, and careful drying at not too high a temperature. Development on the pad is preferred to that on the jig, and an acid rinse after development is recommended to insure removal of any aluminum hydroxide that may be present.

The part played in successful dyeing by penetration is emphasized, as it is noted that more often than not a badly penetrated azoic dyeing will be found to possess poor rubbing fastness. When working out the method of dyeing here described, good penetration was always the aim, and when it was obtained, better rubbing fastness nearly always followed automatically. Thus it is no accident that three important features of the recommended process—efficient preliminary scouring of the material, starting the Brenthol impregnation operation at boiling point and pad development—are, in addition to other advantages, efficient methods of obtaining good penetration.

Details of the recommended dyeing process are summed up as follows: (1) Efficient preliminary scouring of the material. (2) Use of a Brenthol of high substantivity and exhausting with common salt. (3) Dissolving the Brenthol in presence of Lissapol LS and Dispersol L. (4) Application of the Brenthol on the jig, starting at b.p. and continuing in a cooling bath. (5) Intermediate drying between impregnation and development. (6) Development on the pad. (7) Acid rinsing after development. (8) Soaping in a high concentration of Lissapol LS and soap without soda ash. (9) Efficient final rinsing.

This useful paper is from the laboratory of the Dyestuffs Group, Imperial Chemical Industries, Ltd.

The Oxidation of Oil on Dyed and Undyed Tops

Speakman and Murthy—J. Soc. Dyers & Col., 56-252, *June,* 1940.—One of the several requirements to be met by an oil intended for use on wool is that it shall not show too great a tendency to oxidize. In addition to several known causes leading to excessive oxidation of oil films on wool fibers, the authors reasoned that the rate of

oxidation of olive oil, the one commonly used, would probably vary with the pH of the wool to which it is applied. They accordingly undertook an investigation of this point, with observed results which they believe serve to explain a number of anomalies in the behavior of olive oil on undyed wool.

In outline, the experimental process consisted in bringing strips of a selected worsted fabric to different pH values by immersion in appropriate buffer solutions. After attaining equilibrium they were removed from the solutions, centrifuged, dried and oiled with five per cent olive oil, calculated on the conditioned weight of the fabric. The oiled strips were then stored in a humidity room and the extent of oil oxidation determined at intervals.

The characteristics of the olive oil employed in the investigation were determined by means of its saponification value, iodine value and Mackey test. The buffer solutions used were citric acid plus disodium hydrogen phosphate, sodium hydroxide plus potassium dihydrogen phosphate, sodium hydroxide plus boric acid and sodium hydroxide plus disodium hydrogen phosphate. The wet-out strips were kept in the buffer solution for 24 hours at 22.2° C., the pH of the solution being determined before and after equilibration of the cloth. Below pH 10 all pH measurements were made by means of the glass electrode, above pH 10 by means of the hydrogen electrode. The pH of the solution in equilibrium with the cloth was assumed to be the pH of the wool itself.

After removal from the buffer solution and drying the strips were treated with five per cent olive oil on their conditioned weight by application of a solution of the oil in ligroin. Upon evaporation of the solvent the strips were stored in the humidity room for the required periods, when they were extracted with ether and the iodine value of the extracted oil determined.

It is noted that particularly severe oxidation sometimes occurs on wool tops dyed in oil. As no satisfactory explanation of this fact could be offered in terms of the pH of the wool, a separate investigation was made in the case of dyed tops. The results of both studies may be summarized as follows:

On undyed wool, the rate of oil oxidation first increases, and then, above pH 9.5, decreases with the rise of pH. The decreased rate of oxidation on alkali-treated wool is due mainly to the anti-oxygenic action of the cysteine side chains (sulfydryl groups) formed as a result of disulfide bond hydrolysis. In practice, however, the pH values of undyed tops are within the range of pH where oil oxidation is most rapid, and it would therefore appear advantageous to employ neutral detergents in backwashing. The excessive oxidation which sometimes occurs on tops dyed in oil cannot, however, be referred to the pH of the wool, which was acid in all cases examined. The cause was ultimately traced to an exceptionally high iron content of the tops. Iron has a marked pro-oxygenic action, and is introduced into the oil by the corrosive action of the acid retained by the wool when the latter is not sufficiently washed off or neutralized before being processed on wool textile machinery.

The communication is from the Department of Textile Industries of Leeds University.

Color Fastness—

(Continued from page 137)

which were not for dyeing with the best vat colors obtainable, as we have felt right along that merely having these fabrics dyed with colors which were fast to light, and not fast to washing, or vice versa, did not cover the requirements of the trade. Although it is true that there is a special specification test under the two methods described above for fabrics other than cottons and/or linens, however, it is our feeling that washing specifications should be the same on spun rayons for colors to be called fast to light and fast to washing as are specified for cotton and/or linen fabrics, or else they should not be permitted to be sold as guaranteed fast colors.

"At the present time, stress is being laid on the setting of the cloth, and on the light fastness, whereas the washing specifications are still down to around 100 to 140 degrees.

"As we have advised you in previous conversations, and in correspondence, we can only guarantee to use the best vat colors obtainable in dyeing cloths which you send us, but we can definitely guarantee your spun rayon cloths to be as fast in every case as the cottons which we have done for you over a long period of years, as the same dyes are used in dyeing the rayons and mixtures as are used in dyeing comparable shades on the cottons. Certainly cloths dyed with direct, sulfur, or developed colors should not be permitted, therefore, to carry the same guarantees as the cloths dyed in good vat colors, as if this is going to be the market practice, there is going to be no way to differentiate between the quality of one type of merchandise and the other.

"It is all very well to demand guarantees, but until it is thoroughly understood that the better work, and the use of better colors demand higher costs, and therefore higher prices, the spun rayon field will flounder along the same way as the cotton field did years ago."

A few weeks ago the Textile Fabrics Association made a very laudable recommendation to its members, namely, that converters secure a written statement from their finishers as to color performance of spun rayon fabrics based on laboratory tests. To this there can be no objection—certainly not in the case of the better lines. When it comes to cheap work which has been insisted on by the converter and reluctantly agreed upon by the finisher a clear understanding regarding fastness guarantees would be very illuminating. Isn't the finisher entitled to equal protection? If he is required to certify to the converter and manufacturer the fastness of his dyes, the latter should also obligate themselves to the finisher to merchandise goods so described in this specified manner and no other so that his name will not fall in ill repute through mis-

representation and he will not be called upon to satisfy claims for a standard of quality which he was not paid to deliver.

Before sitting down I will answer two self-addressed questions because I know they will occur in the minds of many of my listeners.

First. Do you stress vat colors because they cost more and yield a larger margin of profit to your customer, the dyer? No! The dyer pays more for them and their application cost is considerably higher. Vat dyed goods present a much more difficult problem of basic cost, equipment requirements, skill of manipulation, higher priced personnel, and longer time cycles. On the basis of cost versus return, the finisher is better off to avoid vat colors. He recommends them and prefers to use them because they eliminate claims and assure better relations with his customers.

Second. If 140° F. is a difficult washing test—why not use 100° F.? Maybe 140° F. is just an arbitrary temperature. No, dear friends—tough though the test is for in between colors 140° F. in a washing machine is the practical requirement of children's, men's and sportswear. One may wash a baby at 100° F. but not a soiled garment.

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Pile Fabrics—

(Concluded from page 140)

readily hydrolyzable form. Whittier and Gould claim to have formed an aluminum compound.[12] Ferretti, in fact, by his method of treating casein has probably chaotically broken his product down until it is partially hydrolyzed before being spun.[13]

American users of a protein-base fiber will doubtless demand a strength capable of withstanding reasonable carding, combing, and spinning operation without help from other fibers. They will require dyeing properties similar to wool, under the same conditions of dyeing, because casein fiber and wool will be frequently mixed. Felting properties should be good in mixtures with feltable materials. The product must have a permanency which will avoid any breakdown by bacteria, mold, etc. It must withstand all common cleansing agents under normal conditions of use. In general, a satisfactory fiber must go into a textile mill, be blended with other fibers, and withstand all the operations common to a textile plant without requiring any change in operating conditions.

When, and if, a casein-base fiber is produced and offered to our domestic trade, which meets the above requirements, it will doubtless find a successful use in many classes of textile goods. In addition, such a fiber will have many properties unique to itself and, without supplanting or interfering with the use of any present textile fibers, will add materially to the versatility of the textile industry.

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